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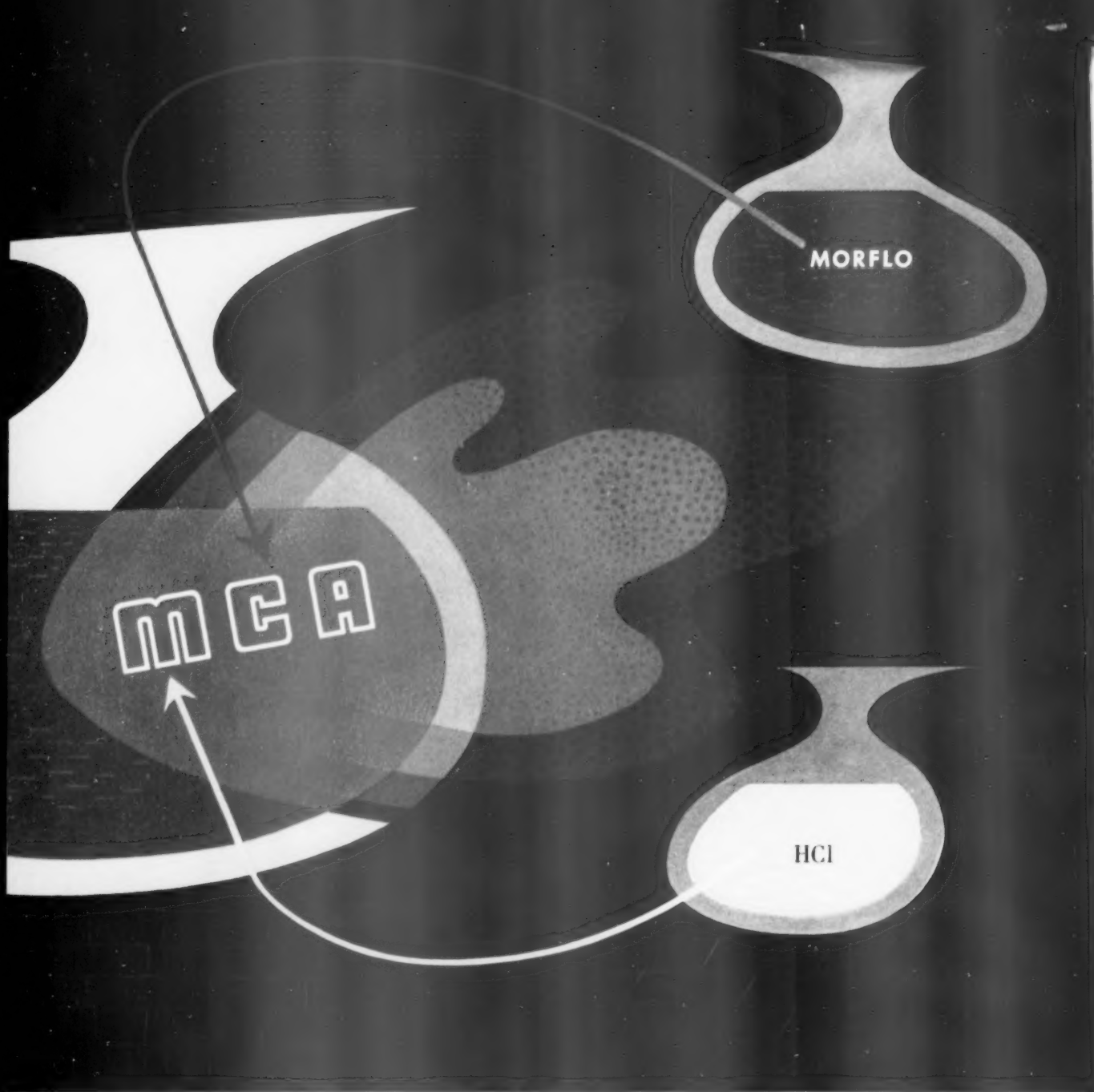

RESEARCH · · *Increases Permeability for Progress*

Were it not for man's research an emulsion of mystery would make our tomorrows as impermeable as shale. Big research is therefore the responsibility of leadership – accepted fully in its field by Halliburton. A recent major research development is Halliburton's MCA. This double duty chemical compound breaks water blocks and water-oil emulsions, and shrinks bentonite to increase pay zone permeability. The results of MCA in production improvement are most gratifying. Halliburton's extensive and energetic research program will continue to increase permeability for progress... all-important in the sound selection of a service company.

★ PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

HALLIBURTON OIL WELL CEMENTING COMPANY DUNCAN, OKLAHOMA

the OIL AND GAS JOURNAL

SEPTEMBER 14, 1953 VOL. 52 NO. 19

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In Brief . . .

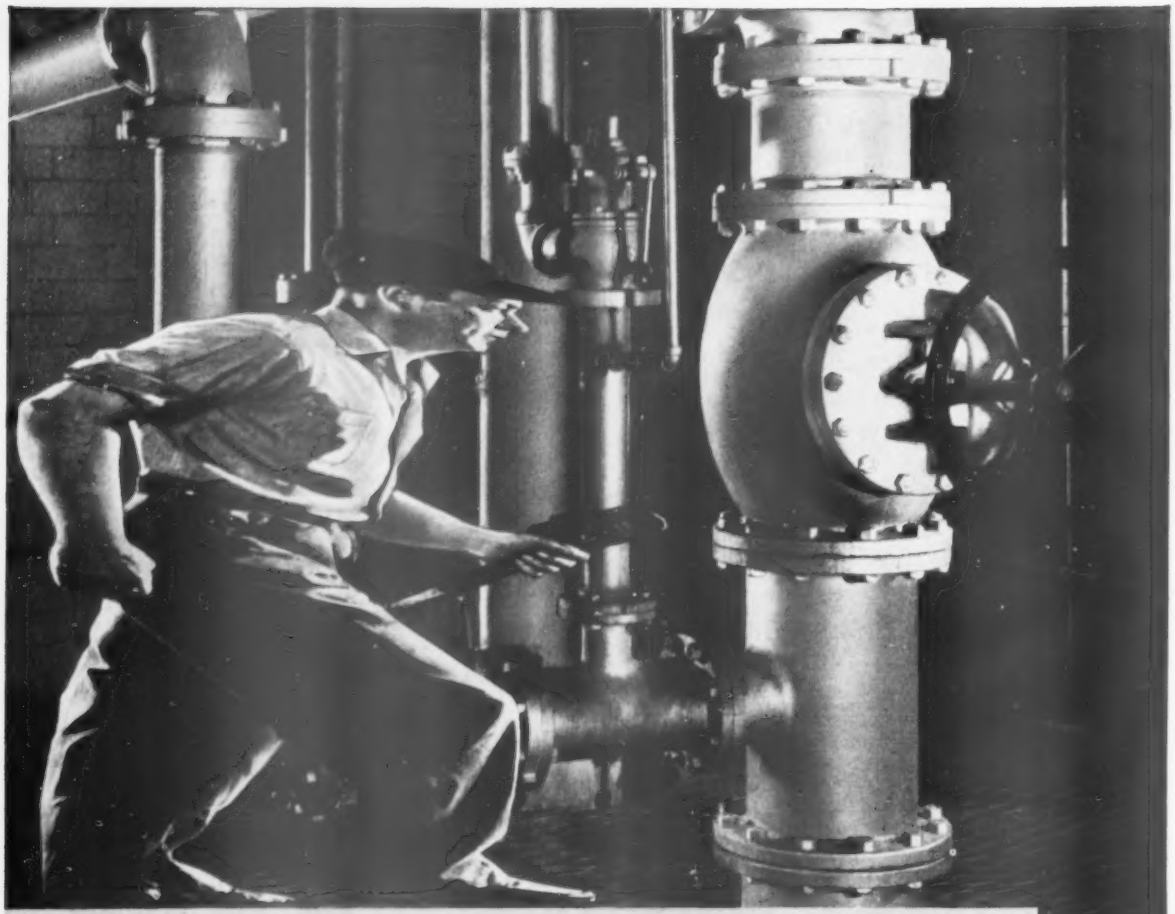
1. CAT POLY CONTROL . . . Day-to-day performance and effective catalyst life for catalytic polymerization units can be checked by determining olefin contents of the feed, product, and intermediate streams. Sampling with pencil bombs and depressuring procedure are outlined. From daily spot samples of fresh feed, total reactor feed (fresh feed plus recycle), effluent streams from each reactor, combined effluent from separate rows of reactors and individual light-product streams, equations can be developed for (1) per cent conversion, (2) over-all conversion, and (3) catalyst life.

2. CIRCLE RIDGE . . . This field, located in Fremont County, Wyoming, is one of the most complex producing geologic structures in the Rocky Mountain province. Circle Ridge is a small, asymmetric anticline situated in proximity to the south flank of the Owl Creek range in the western constriction to the Wind River basin. High initial oil rates of black 23° A.P.I. gravity crude are obtained from the Madison limestone, Tensleep sandstone, and Phosphoria dolomite at depths of less than 2,000 ft.

3. SPAGHETTI STRING . . . A 1¼-in. spaghetti string of tubing inside the regular tubing string is employed to aid in operation and control of the Union Sulphur & Oil Corp. A-1 Walker in Lake Arthur field of Jefferson Davis Parish, Louisiana. The spaghetti string facilitates application of chemicals to mitigate corrosion of tubular goods and also enables crews to circulate mud into the well to kill the flow if necessary.

4. HYDRAULIC FRACTURING . . . Nineteen key factors affecting behavior of formations under hydraulic pressure are given here. Effect of these factors was determined by reference to the literature and by conducting small-scale fracturing tests in Continental Oil Co.'s production-research laboratory.

5. PHENOL FROM CUMENE . . . The new B. A.-Shawinigan, Ltd., plant at Montreal, now in operation, is the first commercial unit to synthesize phenol from cumene. This is a joint venture of British American Oil Co., Ltd., and Shawinigan Chemicals, Ltd. Cumene feed stock is obtained from nearby B.A. refinery. Propylene is first reacted with benzene using phosphoric acid catalyst to make cumene. Oxidation and cleavage of cumene is the next step to form phenol and acetone by way of cumene hydroperoxide using the Hercules-Distillers process.



Squeezing the HIGH out of Mr. Overhead

Right now, a lot of plants are giving Mr. Overhead a thorough going over. And while in many areas nothing can be done about high costs, in others a little figuring may show big chances for economy.

Take piping maintenance for instance. At today's labor rates, the cost of servicing inferior and obsolete piping equipment is higher than ever. But it can be reduced—quickly—with better quality equipment that also strengthens your guard against production losses.

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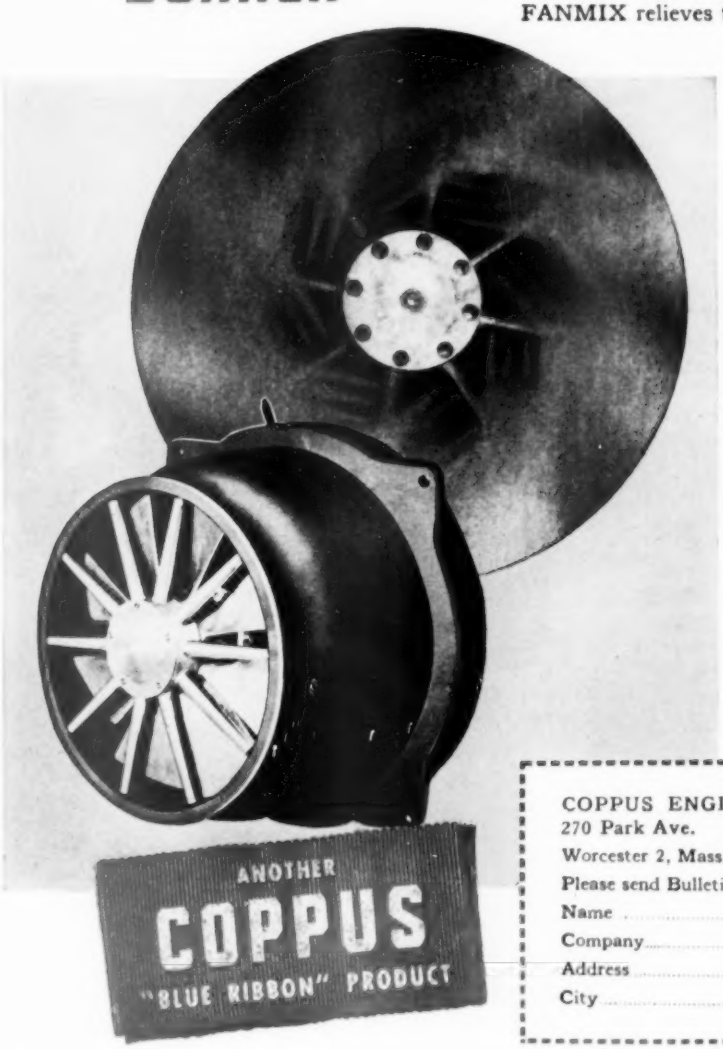

Get the Whole Story

Coppus engineers FANMIX Burners to meet individual requirements, providing complete control over heat pattern and combustion . . . Learn more about how "pinwheel action" can step up *your* boiler performance to peak efficiency and economy — as it is doing throughout industry. Send for Bulletin 410-6. Coppus Engineering Corp., Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, and MINING CATALOGS.

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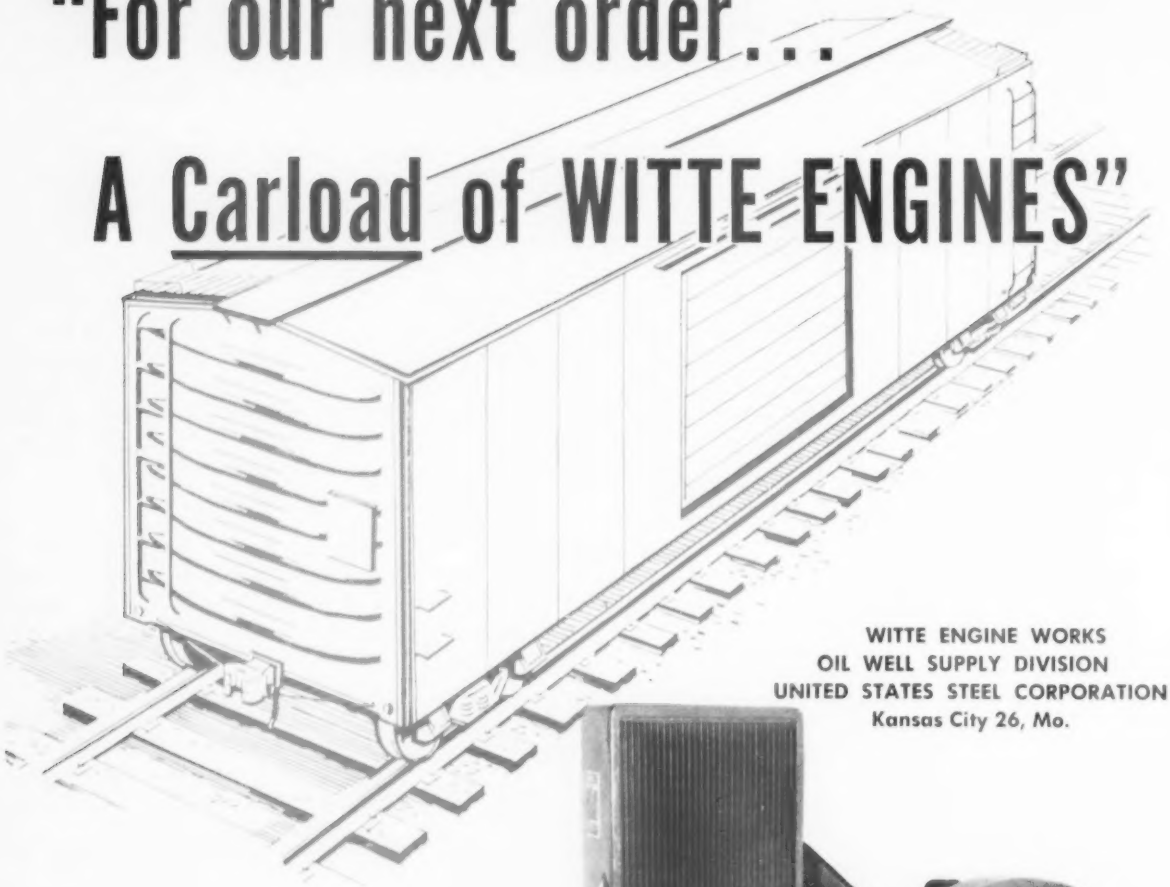

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OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORPORATION
Kansas City 26, Mo.

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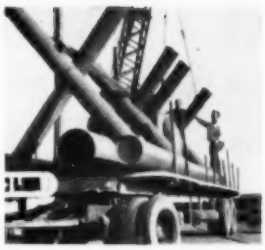

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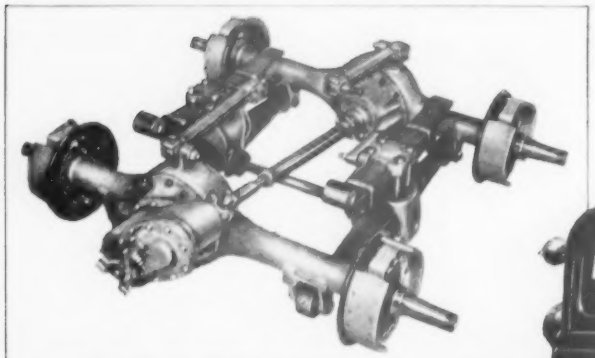
INTERNATIONAL LEADS 6-WHEELER FIELD



The heart of the 6-wheeler is the bogie

Proved performance

makes the sales leader

your best buy

Proved bogie design. International RF-190 Series, GVW ratings, 30,000 to 38,000 lbs. Gasoline, LPG or diesel power.

"Tough Job" engineering has made International Trucks the heavy-duty sales leader for 21 years. International 6-wheelers give you proved performance PLUS the famous International bogie with the third differential.

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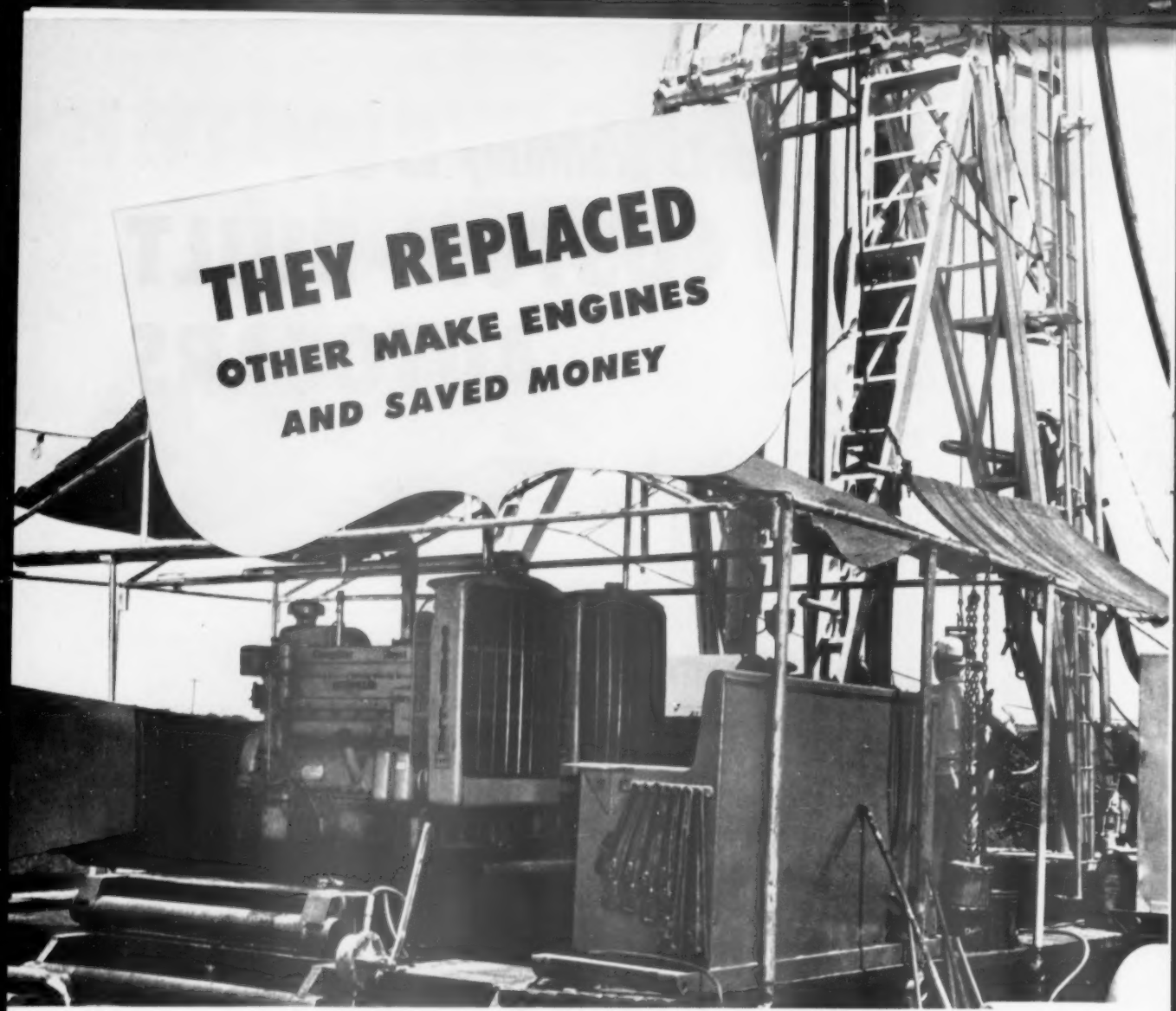

THE two Caterpillar D337 Oilfield Engines powering this 5,000 ft. rig replaced other make Diesels in operation only 14 months.

Foster Drilling Co., Cushing, Okla., found its operating costs soaring with the original power. Having been completely satisfied by the performance of two Cat* D13000 Diesels on another rig, the company repowered with D337s. Drilling depth was increased, operating and fuel costs were decreased, and down time was held to a minimum.

The engines are installed in a split power train. One powers the National T20 drawworks through a torque converter. The other operates the 7¼" x 12" Gardner-Denver mud pump through an air clutch.

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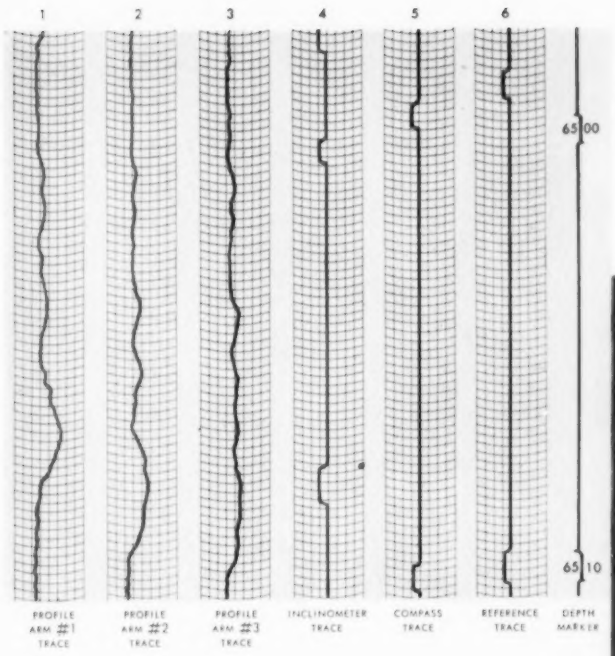

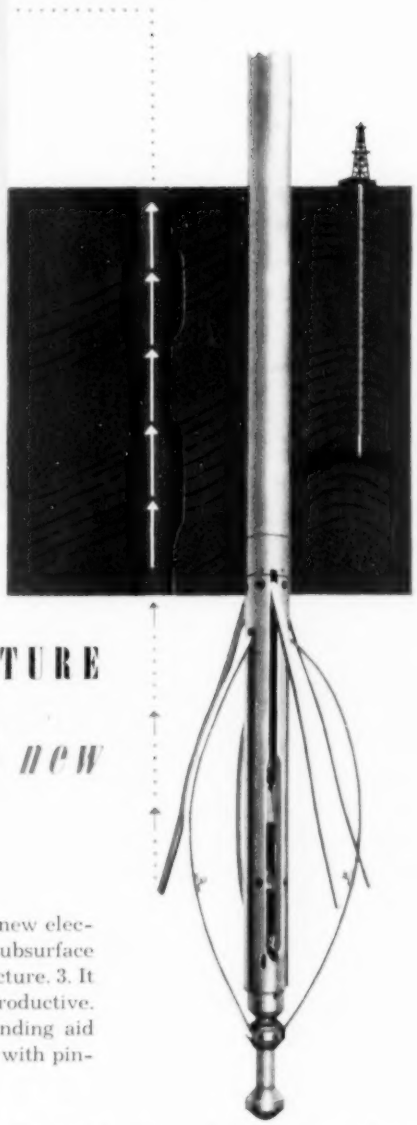

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with HALLIBURTON'S *new* DIP LOGGING

There are three basic reasons for the success of this new electronic well logging device. 1. It determines the dip of subsurface formations. 2. It helps locate test wells higher on structure. 3. It finds direction to develop the reservoir if the test is productive.

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Three sensitive caliper arms electronically record their findings on a lateral scale and depth scale of 1" of record to 1' of hole. In addition, traces revealing orientation of the tool, inclination and direction of hole, depth marker, and a lubber's line are obtained with no stops for station.

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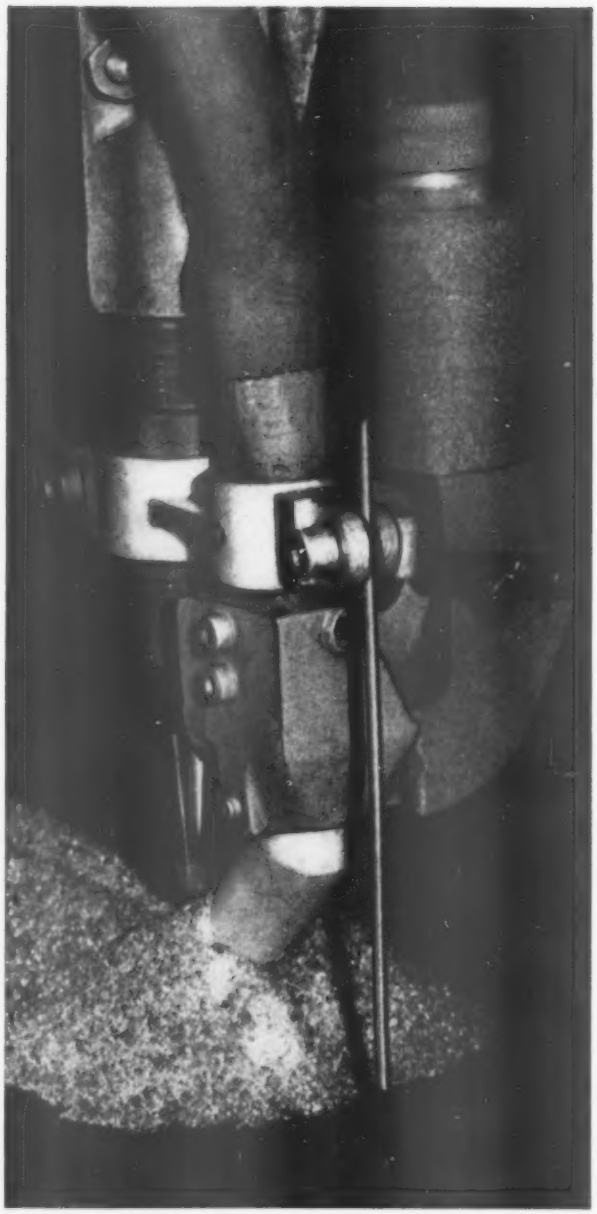
You Can't See



This is UNIONMELT welding—instantly recognized by the special granulated material you see blanketing the weld. *You can't see* the powerful electric arc that fuses the metal beneath at the highest production rate attainable. No sparks or glare disrupt nearby plant activity.

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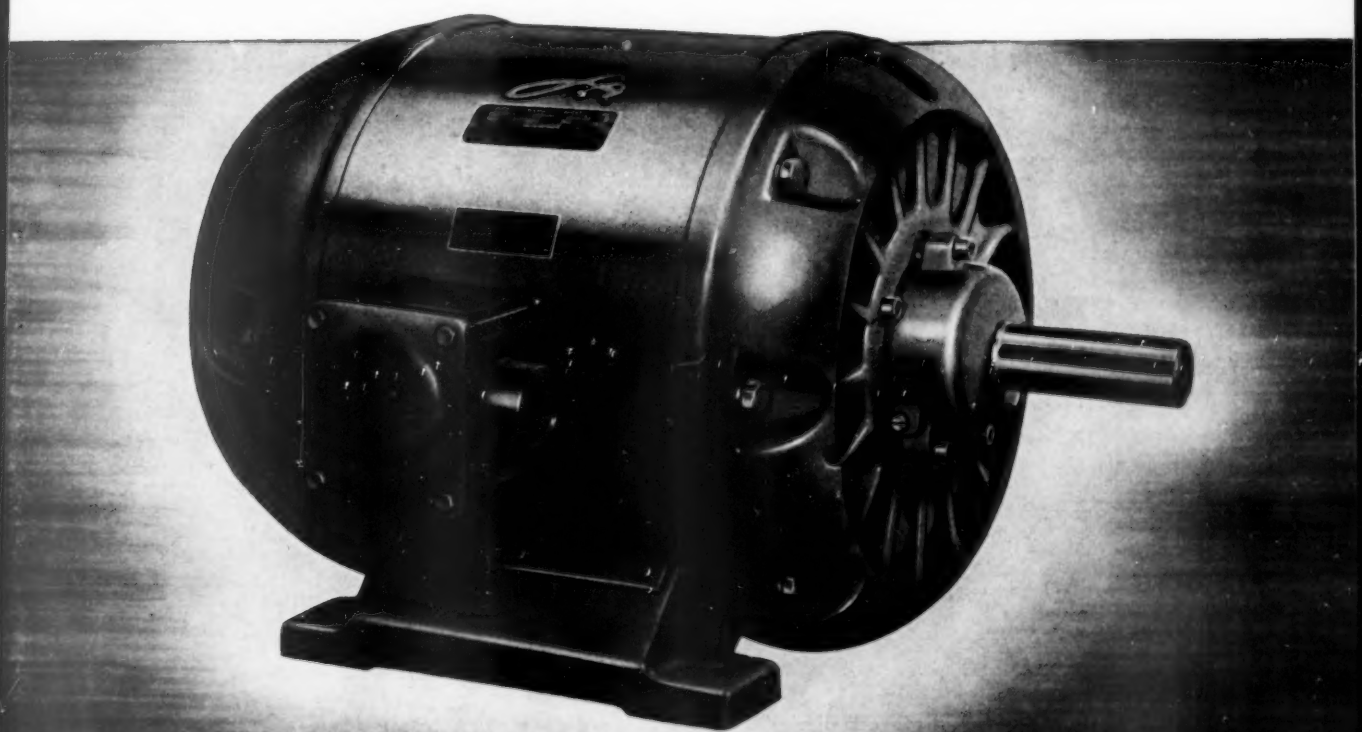

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PEDESTAL SHEAVE BLOCK

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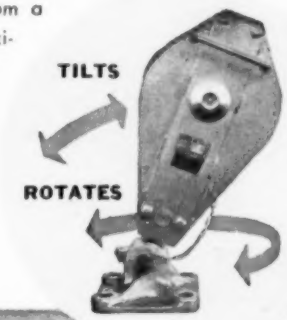

TYPE NR-30 FLOOR BLOCK

The NR-30 can be installed anywhere: chained to the derrick foundation, anchored to a "dead man," or fastened down in any desired method where a concrete foundation has not been poured. This block is used with tractor or hoisting winch for swabbing and for pulling rods and tubing at medium depths. Write for the complete story on what these blocks can do to cut your drilling costs, increase your drilling efficiency. Beaumont Iron Works, one of the oldest oil country manufacturers, builds a complete line of drilling and producing equipment.

BIW

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BEAUMONT, TEXAS

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. . . is a "break" for your delivery costs! The world's most comfortable truck cab cuts driver fatigue!

Keeping the driver happy by reducing driver fatigue is not the only virtue of the new Ford Truck DRIVERIZED CAB.

Easier driving, for example, means safer driving! Easier driving means greater efficiency in terms of more trips, more stops, more deliveries per day—which means a more profitable operation.

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For sustained speed travel, Ford provides new LOW-FRICTION power in V-8 or Six. For faster, easier handling, Ford provides Synchro-Silent transmissions in every model—and new "short-turn" front axles.

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DRIVERIZED DELUXE *cab shown in photos available at slight extra cost.*

SWING *open the new, wider doors!* Door handles are the easy-operating push-button type . . . like you get in quality cars. Door latches are new rotor-type.

HOIST *your size 12's into the cab!* Plenty of room between the seat and door pillar. No need to do a toe dance getting into or out of a Ford "DRIVERIZED CAB!"

SLIDE *into the wide, comfortable seat.* Bounce on it to test the super-cushioning action of Ford's exclusive *seat shock snubber* and new non-sag springs.

SWEEP *your eyes across the new one-piece windshield.* With picture-window visibility like this you can really navigate. Safer driving, of course! Less eye-strain!

GLANCE *back through the 4-ft. wide rear window.* Heads right or left, you can see the space you're backing into. Why pay extra for rear quarter windows?

STRETCH *your arms into big cab roominess.* With more hip-room than any of the 5 other leading makes, FORD DRIVERIZED CABS banish that "squeezed-in" feeling.

New F-900 BIG JOB has a 27,000-lb. maximum G.V.W. It's right at home on extra heavy hauling jobs . . . wheels its 8-ton payload at calculated top road speed of up to 60 m.p.h.

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ECONOMY
TRUCKS

SAVE TIME! SAVE MONEY! LAST LONGER!

"Save money?

Sure!"

THAT, in a nutshell, tells you why so many wire rope users in the oil fields prefer Roebling wire rope... it speeds up operations... lasts longer on the job ...saves money that really adds up.

For the last word in wire rope efficiency and economy, call your nearest Roebling office or distributor for a Roebling recommendation.

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A subsidiary of The Colorado Fuel and Iron Corporation

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THE NATIONAL SUPPLY COMPANY · REPUBLIC SUPPLY COMPANY

Let us help you in planning ahead

One of the most important ways in which we can serve our customers is to assist them in planning for sound growth. Based on past experience and the interpretation of today's business trends, this sound, practical advice is one of the important services offered by The National Bank of Commerce. The National Bank of Commerce has every modern banking facility to serve its industrial depositors. Make The National Bank of Commerce of Houston your bank, and put these services to work for you.

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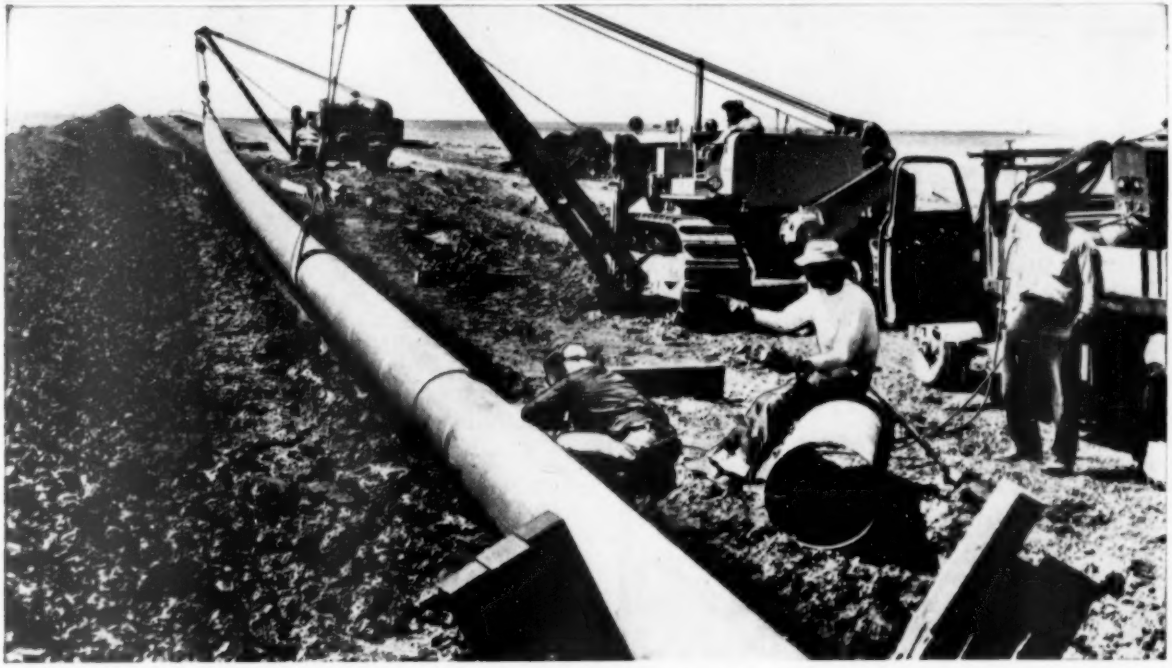
Gulf Building, Houston, Texas "The Bank for All the People"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

PIPE LINE PROGRESS



A string of A. O. Smith line pipe on location during construction of the Interprovincial-Lakehead pipe line.

24-inch looping project to increase Interprovincial pipe line crude capacity

About 135 miles of 24-inch A. O. Smith line pipe is currently being lowered in to loop Saskatchewan and Manitoba section of 16-inch pipe in the Interprovincial Pipe Line. This will add capacity to a transmission system which, by December, will carry western Canadian crudes from the Edmonton, Alberta, area to Sarnia, Ontario.

Upon completion, this will be the world's longest crude oil pipe line, totaling 1738 miles from Redwater to Sarnia.

All the 20-inch and 18-inch pipe in the original line, presently terminating at Superior, Wisconsin, is A. O. Smith pipe. The 20-inch main runs from Edmonton to Regina; the 18-inch completes the run from Gretna, Manitoba . . . just north of the U. S. boundary . . . to Superior.

The present 24-inch installations are part of extensive looping of the 16-inch sector joining the 20 and 18-inch section.

Shipments were made from both Milwaukee and Houston mills, in supplying Interprovincial. A. O. Smith takes pride in its ability to meet delivery schedules, anywhere on this continent, with its high quality, internally expanded, welded line pipe.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝ in. to 36-in. diameters.

FIRSTS by A. O. Smith: Welded line pipe • Internally expanded pipe • Light-wall large-diameter pipe • World's largest producer of large-diameter welded steel pipe.

The A. O. Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

A. O. Smith

CORPORATION

LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas • New Orleans 12
New York 17 • Pittsburgh 19 • San Francisco 4
Seattle 1 • Tulsa 3 • Washington 6, D.C.

International Division: Milwaukee 1

DEPENDABILITY THROUGH RESEARCH AND ENGINEERING

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Economical, Easily Erected, Available for any need, 100% Salvable, Outstandingly Attractive

• Multiple-Type Factory Building made up of 8 Parkersburg Standard Steel Buildings.

Costing much less than conventional types of construction and requiring a minimum of maintenance, Parkersburg Steel Buildings enable you to save many thousands of dollars on your building needs.

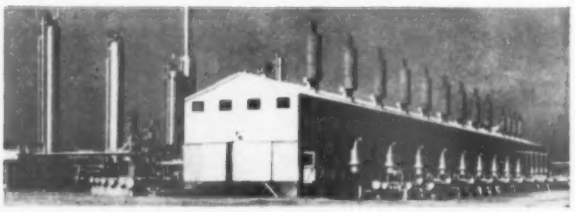
Parkersburg Steel Buildings are available in a wide variety of types and sizes to meet every business and industrial building need. Standard, self-supporting, non-structural type buildings are available in widths from 6′ 8″ to 28′; heights from 7′ to 16′ in any length desired. Standard structural types are available in widths from 32′ to 50′ 8″. Multiple buildings to cover extra large areas can be formed by using multiple units of any standard Parkersburg Steel Building.

The distinctive design of Parkersburg Steel Buildings, plus a choice of several window and door styles, gives them greater eye appeal and attractiveness than any other type of prefabricated building.

Get the whole story on Parkersburg Prefabricated Steel Buildings. Write today for our complete catalog No. SB-7-52.

• Multi-Purpose Portable Utility Building. This building, constructed of 22 gauge galvanized steel, is 10′ 8″ x 8′ x 7′ high. It is reinforced for greater strength and ruggedness; mounted on sturdy welded steel skid base for easier moving and loading. The floor is all welded heavy-duty steel. It has two 4-light windows and a choice of 6 types of doors.

Eliminate the expense of building and tearing down temporary tool sheds and offices on construction jobs by investing in a Parkersburg Multi-Purpose Portable Utility Building.



• Natural Gasoline Plant completely housed in a Parkersburg Steel Building.

• Parkersburg Steel Buildings make attractive office structures. The neat, trim partitions and ceiling assure an attractive interior.

No. 5318

PARKERSBURG
RIG & REEL COMPANY • Parkersburg, West Virginia

meet the man who

Predetermines Performance of MARLEY COOLING TOWERS

He is Donald R. Baker, who directs Marley cooling tower performance-research and testing. Mr. Baker and his staff of associate engineers have changed the standard of measurement for cooling tower rating from a yardstick to a micrometer. Their achievements offer a very tangible benefit to every Marley customer: the assurance that all Marley cooling towers will meet or surpass specified design performance.

Positive predetermination of cooling tower performance is the result of more than a decade of effort by this Marley research group. The project has required the cumulative knowledge of many specialized engineering skills possessed by members of this department. Their approach has been both scientific and practical. Every theory developed has been proven in the Marley cooling tower test plant—industry's first and always the most complete installation of its type. Services of independent research and test organizations have been used liberally to further prove the practicality of every effort.

The published results of Marley test research are available through Marley engineering sales offices in 50 cities. Just ask for Technical Bulletin R-52-P10.

Other Marley research projects: WOOD DETERIORATION AND PRESERVATION, CORROSION OF METAL, PROTECTIVE COATINGS, METALLURGY, WATER TREATMENT, LUBRICATION AND OTHER OPERATIONAL PROBLEMS, MATERIALS SELECTION. *Literature or information available on all subjects.*

The Marley Company

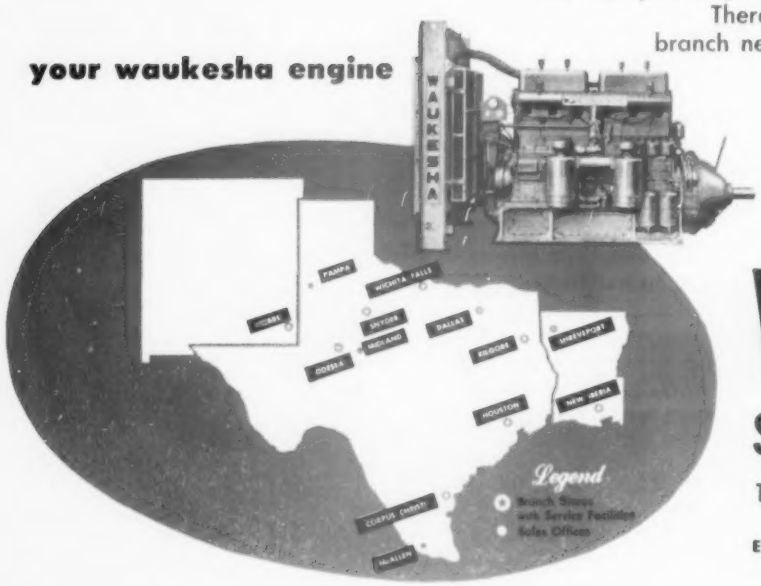
Kansas City, Missouri

there's NO END

TO THE SERVICE AVAILABLE AT WAUKESHA SALES & SERVICE, INC.

From sun-up to sun-up . . . right around the clock . . . your nearby Waukesha Sales and Service, Inc., service shop is ready to give prompt attention to your repair needs. Each branch is staffed with experienced, factory-trained mechanics who ***know*** your engine and how to keep it in tip-top condition at lowest cost. So the next time your engine needs servicing . . . bring it back home. There is a Waukesha Sales and Service, Inc., branch near your operations in Texas, Louisiana, Southern Arkansas, and New Mexico.

your waukesha engine



is treated best at home

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Sales & Service, Inc.

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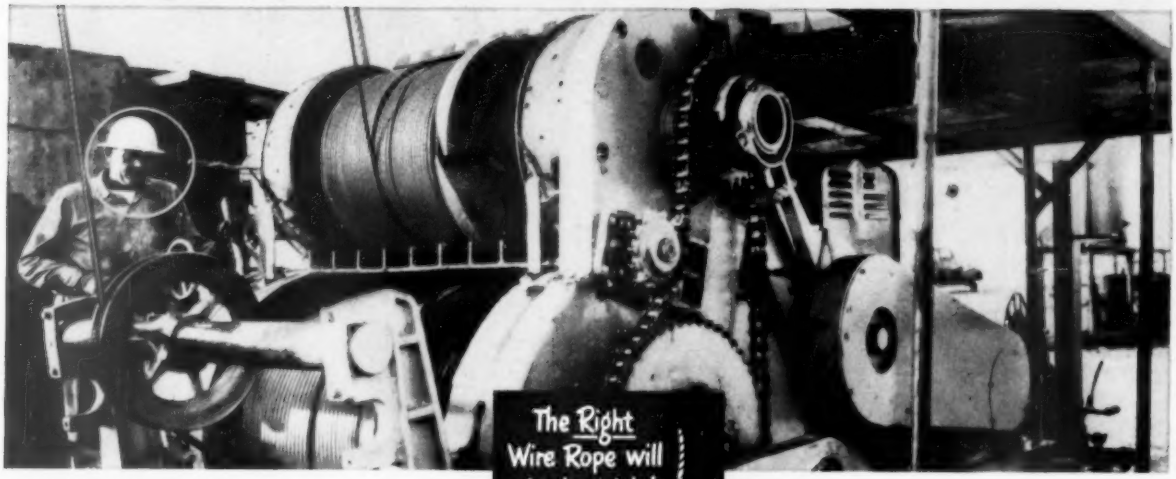
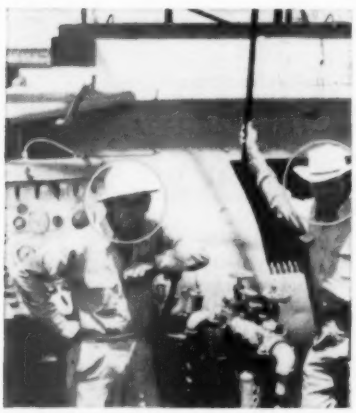
EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND NEW MEXICO

THE MEN WHO USE THEM SAY:
"Tiger Brand Lines are best!"



"PERFORMANCE SOLD US on American Tiger Brand Wire Lines. They're tops with us!" . . . G. A. Monahan & K. D. Cole Rotary Drilling and Cable Tool Well Service. The rig shown had a 7/8" Tiger Brand 6x19 Plow Steel Line. Sand line was 5/8" Tiger Brand 6x7 Plow Steel.



"WE USE AMERICAN WIRE LINES because they give us longer service and less trouble." . . . Tri-Service Drilling Co. The 1¼" Tiger Brand Rotary Drilling Line shown above was used on 7 wells—a total of 49,700 ft. of extremely tough drilling—and it was still in good shape.

"WE DRILLED 9 WELLS with one 7500-ft. length of American Wire Line. It didn't give a bit of trouble in over 93,000 ft. of hole—and still has lots of good service left." . . . Helmerich & Payne Drilling Contractors. It was a 1¼" Tiger Brand 6x19 Monitor Drilling Line with Independent Wire Rope Core.

Ask any driller who has American Tiger Brand Wire Lines on his rig and he'll tell you that they give exceptionally long service. Whether you are down just a few thousand feet by cable tool, or way down deep by rotary, you can count on Tiger Brand Lines for top-notch service.

Ten constructions, three standard grades of steel, and countless sizes, assure you a long-lasting Tiger Brand Line for every job. But you want to be sure to get the right type: the one that will give top performance on *your* particular rig.

Our free booklet, "The Right Rope for the Job," will help you. It lists the right line to use for many typical applications. Send the coupon for a free copy.

American Steel & Wire
Room P-93, Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, your helpful guide book to rope selection, "The Right Rope for the Job."

Name .....

Company ..... Title .....

Address .....

City & State .....

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

"Big Top"

Refinery Style

". . . floats through the air with the greatest of ease . . ." well describes this big-top aerial performer—the cap for an oil-refining pressure vessel 55 feet in diameter. Very much in the act are Sun Ship's riggers and crane operators. They have had long experience in handling giant assemblies and heavy machinery for petroleum refineries, chemical plants, and the many other industries Sun Ship's versatile shops serve by mastering problems of plate work, fabrication, and construction of special machinery.

There's a lot of skilled hard work behind a successful circus act . . . and behind a successful engineering job. Setting a giant pressure vessel's cap in place is just one phase of the job shown above. After these heads are fabricated, assembled, and welded into large sections, the joints of the sections are X-rayed. When "Sun Ship O.K.'d," the head is dismantled for shipment to the refinery.

The building and shipping of such immense special structures give a practical demonstration of how Sun Ship's versatile facilities and engineering know-how are coordinated in serving many industries . . . and how they can build practically any metal equipment needed in industry's task of building a greater America.

Sun

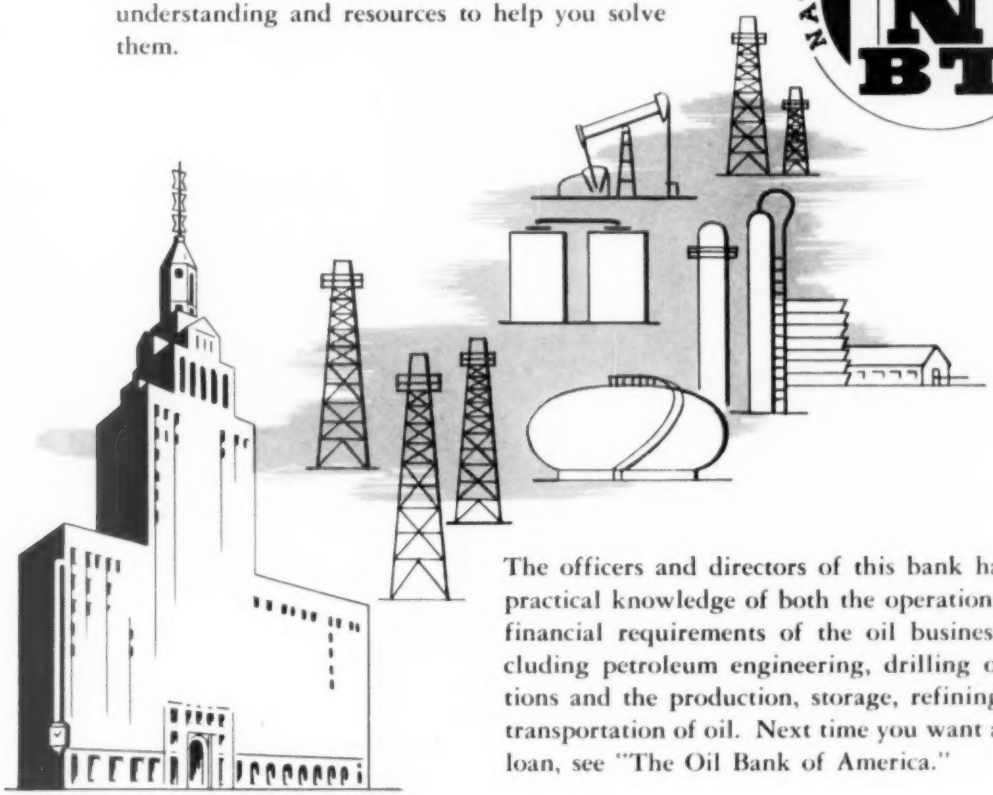
SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE (SINCE 1916) CHESTER, PA.

25 BROADWAY • NEW YORK CITY

NEXT TIME.... See "The Oil Bank of America"!

When it comes to financing oil business operations or an expansion program, the specialized services of this bank include a friendly interest in your problems and the business experience, understanding and resources to help you solve them.



The officers and directors of this bank have a practical knowledge of both the operations and financial requirements of the oil business, including petroleum engineering, drilling operations and the production, storage, refining and transportation of oil. Next time you want an oil loan, see "The Oil Bank of America."

The Oil Bank of America

NATIONAL BANK OF TULSA

OFFERING COMPLETE BANKING AND TRUST SERVICES

Member Federal Deposit Insurance Corporation

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COOLING
CONDENSING
EVAPORATING

Superior Heat Exchangers

are widely used to heat viscous liquids to flow temperature; to preheat fuel oil for more efficient firing; to heat boiler feed water; to heat impregnating compounds for better absorption; to recover heat from boiler blow-down; to heat gases and liquids for refinery and chemical processes; and for a wide range of heating, cooling, condensing, and evaporating applications.

Superior's complete design and manufacturing facilities are geared to handle the most unusual as well as the more conventional requirements.

Our Engineering Department invites your inquiry on any proposed application as a basis for a specific engineering recommendation. Write for catalog 5011.

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SUPERIOR
HEAT EXCHANGERS

Read why the light-weight 1022 Jack is called the "Rigger's Pal" by oil men

No. 1022 "Rigger's Pal"

For erecting drilling rigs and lifting and lowering heavy equipment of all kinds, the Duff-Norton 1022 "Rigger's Pal" Ratchet Lowering Jack is your best bet. Here's why oil men call it the "Rigger's Pal":

- Spotted easily, it can be operated by one man.
- It uses its foot as well as its head. Versatile foot lift starts raise 2¾ inches above base.
- Like all Duff-Norton jacks, the 1022 has the patented, adjustable, spring mechanism assuring absolutely safe, trouble-free service. The spring's tension is easily adjusted with a screwdriver without removing any part of the jack.
- Without straining any part of the jack, it moves 10 tons.
- When closed it is only 22 inches high, yet has a raise of 12 inches.
- It is specially designed for rugged outdoor use.

Get the complete story on the 1022 and other famous Duff-Norton Jacks for oil men. Inquire at your oil field supply store or write the world's oldest and largest manufacturer of lifting jacks. Ask for Oil Field Jack Bulletin AD 19-B, The Duff-Norton Manufacturing Co., P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant —Toronto 6, Ontario.

DUFF-NORTON *Jacks*

"Giving Industry A Lift Since 1883"

For dependable performance in oil-gathering service—take a tip from thousands of oil men and use National Supply's high quality SPANG "CW" Steel Pipe on your next piping job. You'll gain the all-important, on-the-job advantages of easier threading, cutting and bending . . . at no extra cost! And you'll find that this high quality pipe will give long service in any kind of line pipe application.

For every type of oilfield installation—oil-gathering systems, water and gas lines, salt water disposal lines, air lines, water flooding lines—SPANG "CW" can be installed faster, at lower labor cost. Furthermore, it is normally available through your National Supply Store in a complete range of standard sizes.

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NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

THE NATIONAL SUPPLY COMPANY NSCO NATIONAL BLUE PRODUCTS

The Greatest Gasoline Development in 31 Years

TCP*, a Shell discovered additive now blended into Shell Premium Gasoline, sets the pace for the fuels of tomorrow. It's another milestone in Shell's petroleum research.

The long-recognized problem of power loss due to combustion by-products has been solved by Shell research. No longer need these by-products cause the waste of fuel and power associated with missing spark plugs and with pre-ignition.

Shell research has discovered and developed a fuel additive now in Shell Premium Gasoline—called TCP. This additive actually changes the character of harmful deposits *within the engine* so that faulty spark plug operation and pre-ignition are eliminated promptly—often during the second tankful. Old *and* new engines benefit alike.

Shell TCP additive was originally developed for aviation fuels. Up until now it has been restricted to military planes. Without question it is the greatest fuel development since the introduction of tetraethyl lead in 1922.

Important as TCP additive is for cars today, perhaps the greatest significance is its great promise for the future. TCP additive points the way to lighter, more powerful engines—engines with much greater design efficiency than has heretofore been possible.

TCP is Shell's trademark for this additive. It is another example of the progressive research that goes forward day and night in Shell laboratories. It is evidence again that Shell research provides more and better products from petroleum.

*Patent applied for

SHELL OIL COMPANY

SHELL

Here is a magneto that controls explosive fumes with "flame-proof" ventilation. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low tension voltage to the high tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

For safety and low operating costs it will pay you to specify Bendix Low-Tension for all your magneto requirements. Complete data available on request.

- Low Plug Erosion Rate
- Breaker Type Distributor
- Ventilation without Fire Hazard
- Radio Shielding Available
- Variable or Fixed Ignition

Bendix

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Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

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GAS-TREATING CHEMICALS

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Monoethanolamine, Diethanolamine } *For H_2S and CO_2 removal*

Diethylene glycol, Triethylene glycol } *For H_2O removal*

RAPID DELIVERY IN:

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- drums in carload lots
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Drum lots shipped from Dallas, Houston, Tulsa, New Orleans, Kansas City, Chicago, Salt Lake City, Denver, Los Angeles, San Francisco, and 40 other warehouses throughout the country.

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Offices in Principal Cities
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U.S. Rubber keeps the "shakes" away from this barge

In planning this off-shore oil-drilling barge – largest and most modern in existence – the designers *had to* make sure that her many drilling and pumping engines would not subject her to destructive vibration. They consulted United States Rubber Company engineers. The answer was quick and effective. Rubber mountings were installed to cushion the engines. Rubber couplings were installed to protect drive shafts from vibration. U.S. Expansion Joints were put on the pumps in the circulating line to take up vibration and misalignment. Ever since her first day on the job, the barge has had no case of "the shakes." Men wonder how they ever lived through it before. Now the owners are pleased, and off-duty crew members can relax in restful comfort. Their quarters are *free of vibration* and *free of noise*.

U.S. Mountings are also used on engine generators, welding machines, and air compressors. Whenever you have a problem involving the transmission of vibration and noise, or require mechanical rubber goods, always call on any of our 25 District Sales Offices, each staffed with engineers. Remember that "U.S." products give you *economy* because they are *quality* products. Write to address below.

This U. S. Rubber Mounting is one of four installed under each of the engines that operate the draw works of the drilling rig.

U. S. Expansion Joint is at the suction end of every mud pump to take up vibration and misalignment.

This U. S. Rubber Coupling, installed on the power take-off end of the large engines that operate the draw works, stops the transmission of vibration. This coupling is widely used in the oil fields.

Developed by Engineers
Proved by Drillers

U.S. RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

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in STRENGTH there is SERVICE

Oil production requires strength — in men, materials . . . and financing. At Republic National of Dallas, the strongest capital structure in southern banking means broader, better service to the Southwest's leading industry.

Capital and Surplus $50,000,000.00
Largest in the South

REPUBLIC NATIONAL BANK OF DALLAS

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Three of a kind...

AMONG THOUSANDS OF A KIND

THAT EXTRA SERVICE—for which Standard Oil dealers are famous—takes businessman E. Kenneth Horton of Sterling, Kansas, to regular meetings of the City Commission. He has served his city for a number of years as mayor and commissioner. As a businessman and city official, Mr. Horton knows the value of efficient operation. It helps keep costs down. And efficiency in the oil industry helps keep the price of gasoline today about the same as in 1925. Only taxes are higher.

THESE THREE MEN are successful independent businessmen. Though they live in different cities and have never met, they have much in common.

They are leaders in their communities, serving their neighbors in such activities as government, service clubs, scouting, business. They are three of a kind . . . three of the thousands of Standard Oil dealers who serve you in many ways every day—from helping on civic programs to servicing cars.

These Standard Oil dealers own their own businesses . . . are their own bosses. Before they invested sizable amounts of money they decided that they must have two things—quality products and a dependable supply.

They found that Standard Oil and its subsidiary companies stress product quality and process development so much that a total of 2,500 men and women are employed full time in our research departments.

They learned that in recent years Standard Oil has plowed back two-thirds of its profits into expanded facilities all along the line—from drilling rigs to gasoline pumps—to assure a steady supply of petroleum products.

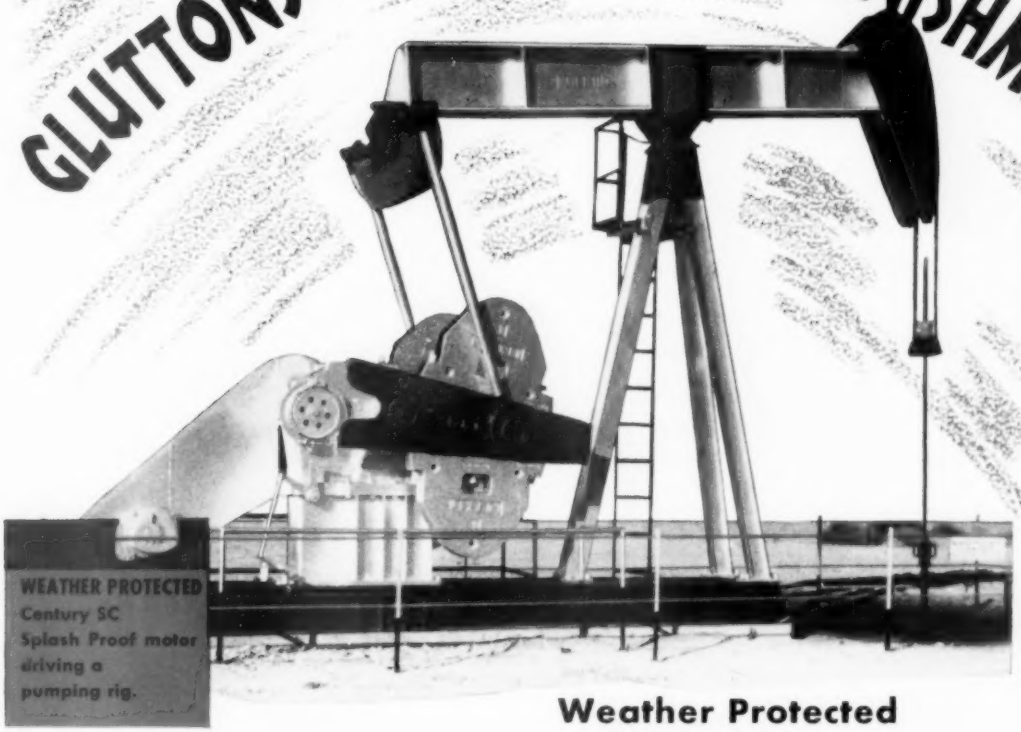
They found, too, a growing demand for Standard Oil products. They know that here in the Midwest, where you see the Torch and Oval sign, Standard Oil dealers serve far more motorists than do any other group of dealers.

Standard Oil Company
(INDIANA)

THAT EXTRA SERVICE becomes a habit for businessmen like A. Gibson, Jr. of Oshkosh, Wisconsin. Despite a crowded business day, Mr. Gibson has found time to serve on the board of the Oshkosh Chamber of Commerce, in Community Chest drives, and on other civic projects. In addition to being a director of the First National Bank of Oshkosh and a prominent automobile dealer, he owns a highly successful 24-hour Standard Oil service station.

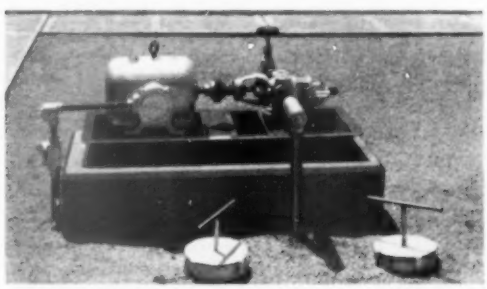
THAT EXTRA SERVICE doesn't end when businessman W. L. Johnson (standing) leaves his Standard Oil service station in Watertown, South Dakota. He is president of the Kiwanis Club and is a director of the Chamber of Commerce. Such teamwork helps a community. And teamwork by more than 51,000 Standard Oil employees, each backed by an average investment of $34,000 in tools and equipment, helps us to supply constantly increasing demands.

GLUTTONS FOR PUMPING PUNISHMENT



WEATHER PROTECTED Century SC Splash Proof motor driving a pumping rig.

DEPENDABLE Century MOTORS



UNDERWRITERS' APPROVED Century Explosion Proof motor driving a pipeline station sump pump.

Weather Protected
for steady outdoor service

Explosion Proof
for safety in refining and distribution

The extra ruggedness built into every Century motor is your protection against unforeseen operating conditions.

Century motors are built to stand up under unusual demands. In addition, they'll serve you better because you can fit each job with a Century motor that's just right for it. There is a Century motor engineered for every popular need in oil production, refining and distribution.

For further information on Century motors for your pumping rigs, water pumps, air compressors, mud screens, fans and blowers, ask at your supply store.

Century C MOTORS

CENTURY ELECTRIC CO.
1806 Pine St. • St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

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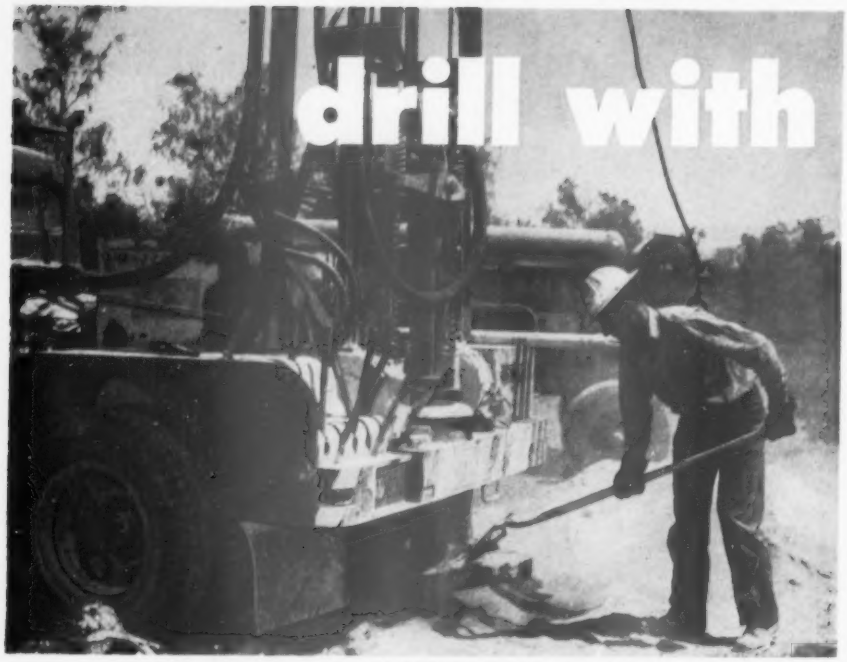


Air drilling in West Texas with the new TI Shot Hole Rig.

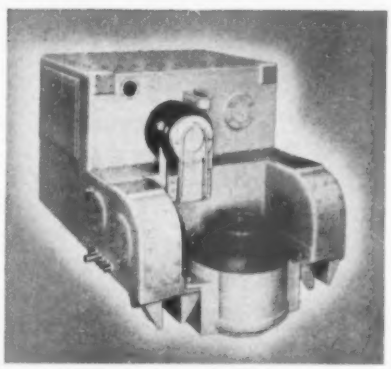
use TI's versatile Shot Hole Rig!

IN WATER-SCARCE AREAS, air drilling with TI's versatile, portable Shot Hole Rig is solving the tough problem of thirsty formations. Drilling with air—and TI's new drill—removes the cuttings from the hole quickly and economically.

And whatever the area—dusty *or* damp—the sealed-unit construction of the new INTEGRATED POWER DRIVE protects the machinery. Gears, chains, clutches, and other moving parts are completely sealed in a single case and continuously spray-lubricated with *filtered* oil.

For *any* drilling problem—whether it calls for air, water or casing drilling—the TI Shot Hole Rig will give you lower cost per foot of hole.
Write *today* for complete literature.

TEXAS INSTRUMENTS
INCORPORATED
6000 LEMMON AVENUE DALLAS 9, TEXAS



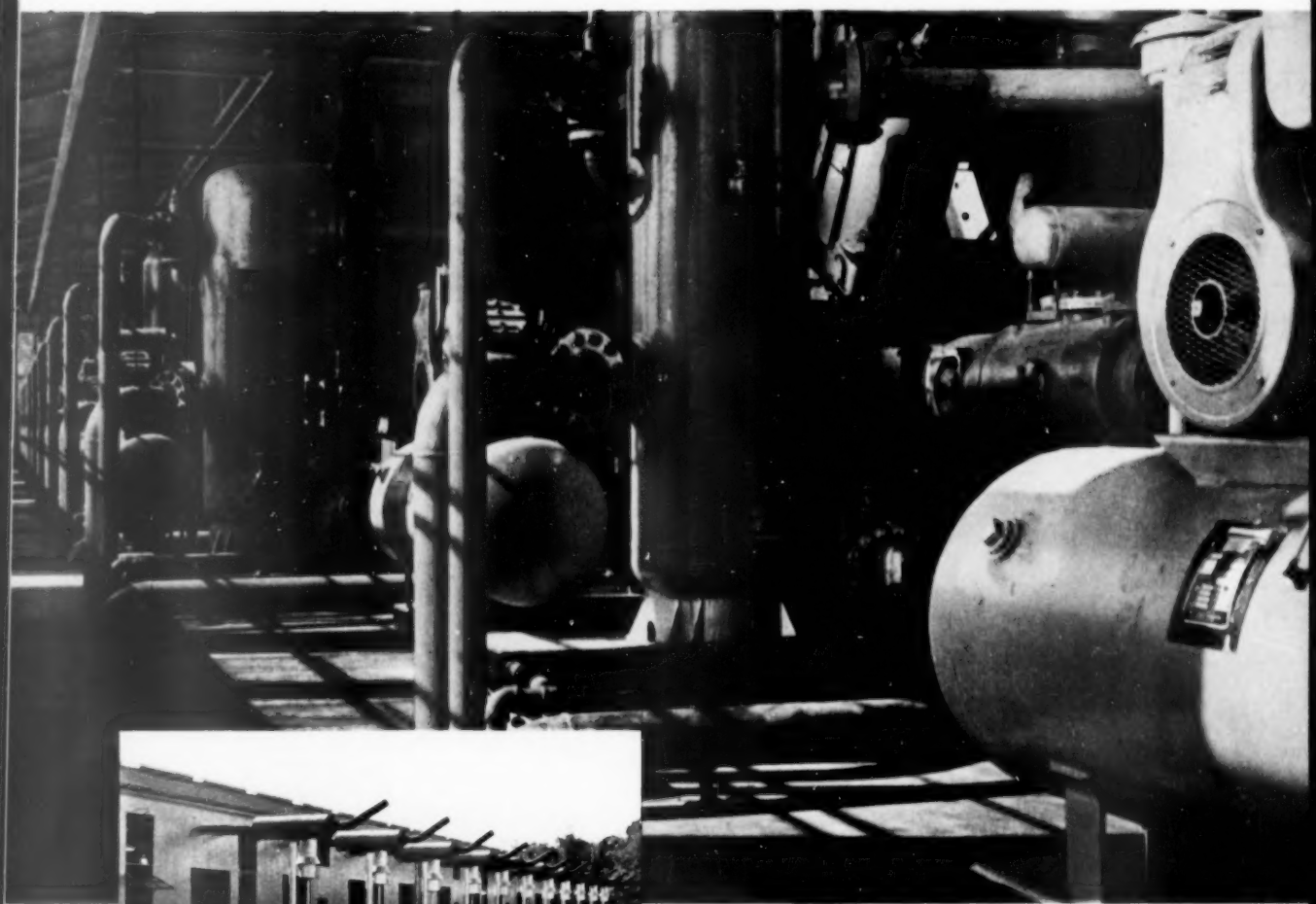
NEW INTEGRATED POWER DRIVE

Long life and low maintenance costs are inherent in the sealed-unit construction of the INTEGRATED POWER DRIVE, heart of the TI drill. All the components necessary for the transfer and control of power have been brought together in a *single* case with centrally located controls. Rotary table, pull down drive, kelly hoist, hoist drum, and pump drive are so integrated with the primary power drive that transfer of power for *all* drilling operations is accomplished in a *single sealed unit.*

BEAIRD-INGERSOLL-RAND

Packaged Compressor Plant

Lowest Cost Per Horsepower Installed



These completely packaged compressor plants are equipped with Ingersoll-Rand 6SVG and 8SVG gas engine-driven compressors and Young radiators. Other sizes from 110 h.p. to 550 h.p.

4620 horsepower — COMPRESSOR STATION USES ELEVEN PACKAGED PLANTS

NEW YORK STATE NATURAL GAS CORPORATION is boosting field gas from wells in Leidy Field, Pennsylvania into a transmission pipeline. To supply the required 4620 horsepower, they installed a bank of eleven Beaird-Ingersoll-Rand packaged compressor plants, nine 440 horsepower units and two 330 horsepower units.

Each of these is a complete compressor plant, with its own gas scrubber, manifolds and piping, cooling system, lubrication system and automatic controls. Each compressor unit is assembled on a rugged steel base which requires only a simple concrete slab as a foundation.

Let us tell you about the economy of using Beaird-Ingersoll-Rand packaged compressor plants—singly or in multiple unit installations.

THE J. B. BEAIRD COMPANY, INC.

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BEAIRD

MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

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LP-GAS SYSTEMS

BEAIRD ***Cast Steel Fittings***

FITTINGS *IN A HURRY*

Need fittings in a hurry? Want to be sure of meeting your deadlines? Have to meet an emergency with minimum down time? Then ask your supply house... or call us direct... for immediate shipment of Beaird fittings from our large stock of standard sizes. Save time in ordering by using the convenient selection charts and figure numbers in our new catalog No. 153. We can also give you prompt delivery on special fittings from our wide assortment of patterns.

Write for Catalog 153 and let us put your name on our mailing list for current stock lists.

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UNIT RIG Draw Works are designed by field-experienced engineers. Every new model is thoroughly tested in actual drilling operations before it is offered for general sale. That's one of the many reasons why UNIT RIG equipment operates smoother, faster, and economically. Ask any engineer who has had experience with a UNIT RIG Draw Works and he'll tell you why UNIT RIG is your best draw works buy.

FOR DRILLING TO 12,000 FT. . . buy a U-20. Its low, compact design and maximum weight of less than 50,000 lbs., solves the portability problem. Addition of sand line drum can easily be made in the field without altering the main case. For complete information on the U-20 — write for catalog TODAY.

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

• **DESIGNED FOR THE JOB . . .**

UNIT RIG DRAW WORKS ARE SOLD EXCLUSIVELY THROUGH THESE AUTHORIZED DISTRIBUTORS IN THE U.S.A. AND CANADA

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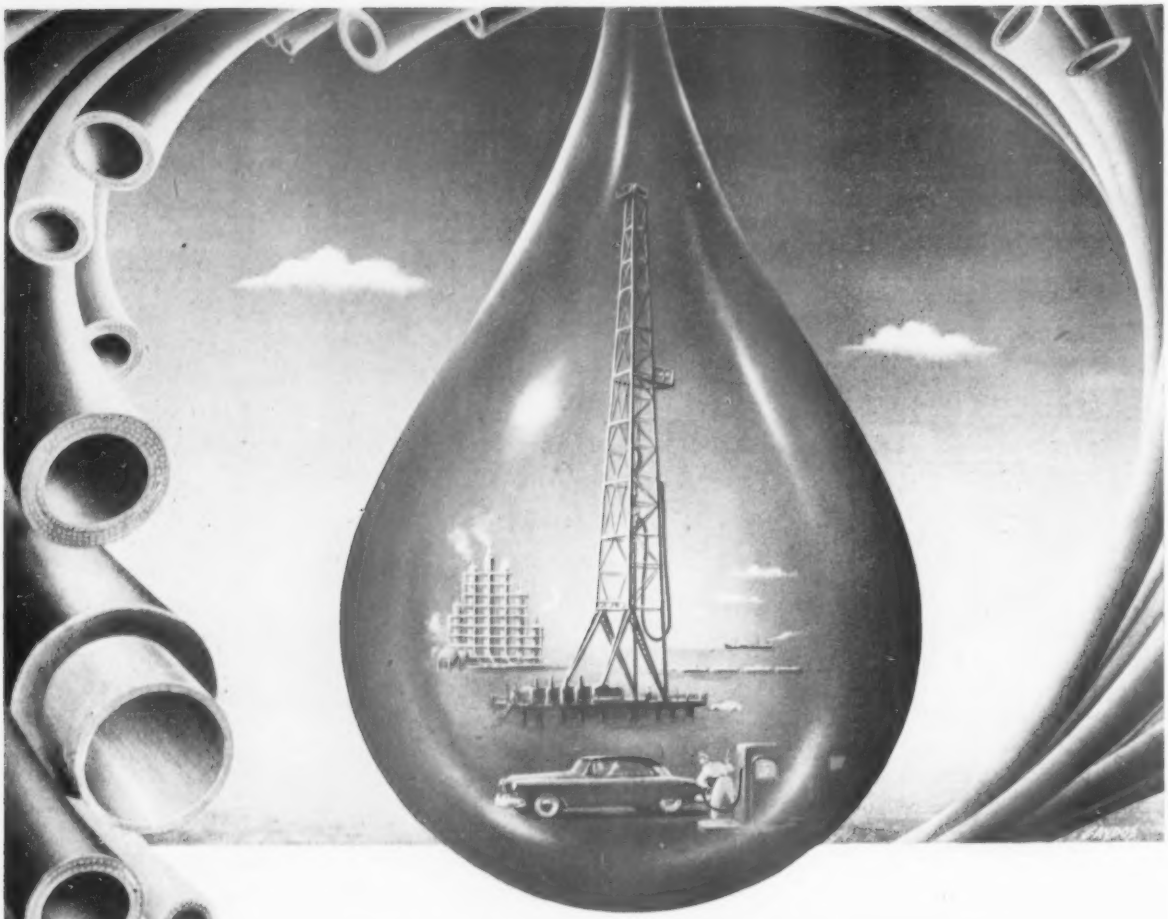

WE LINK DRILLING TO DRIVING

Whatever your hose need . . . whether it's hose for a drilling rig . . . hose to load and unload tankers or tank cars . . . hose to feed fuel to factories, homes or automobiles . . . your Hewitt-Robins distributor can supply you with the right answer.

In all phases of the petroleum industry . . . drilling, processing, refining and distributing . . . wherever hose is essential, Hewitt-Robins is recognized as a pioneer. Today we make over 50 different types of specialized hose for petroleum products alone . . . latest members of this famous line are the new cable-reinforced rotary drilling hose with Stratolined coupling, and the new 100-foot-long LP gas reel hose for bulk delivery trucks. In addition, Hewitt-Robins also provides the petroleum industry with hose for handling air, steam, water, mud and chemicals.

For immediate information regarding specific types of Hewitt-Robins petroleum hose, or *any* Hewitt-Robins industrial hose, contact your local Hewitt Rubber Distributor. He can meet your need with a Hewitt-Robins hose which guarantees top value, long life and superior performance. See Classified Phone Book—Rubber Goods-Mechanical; Rubber Products-Mechanical; Belting-Mechanical; Hose & Tubing-Rubber, or write to us directly.

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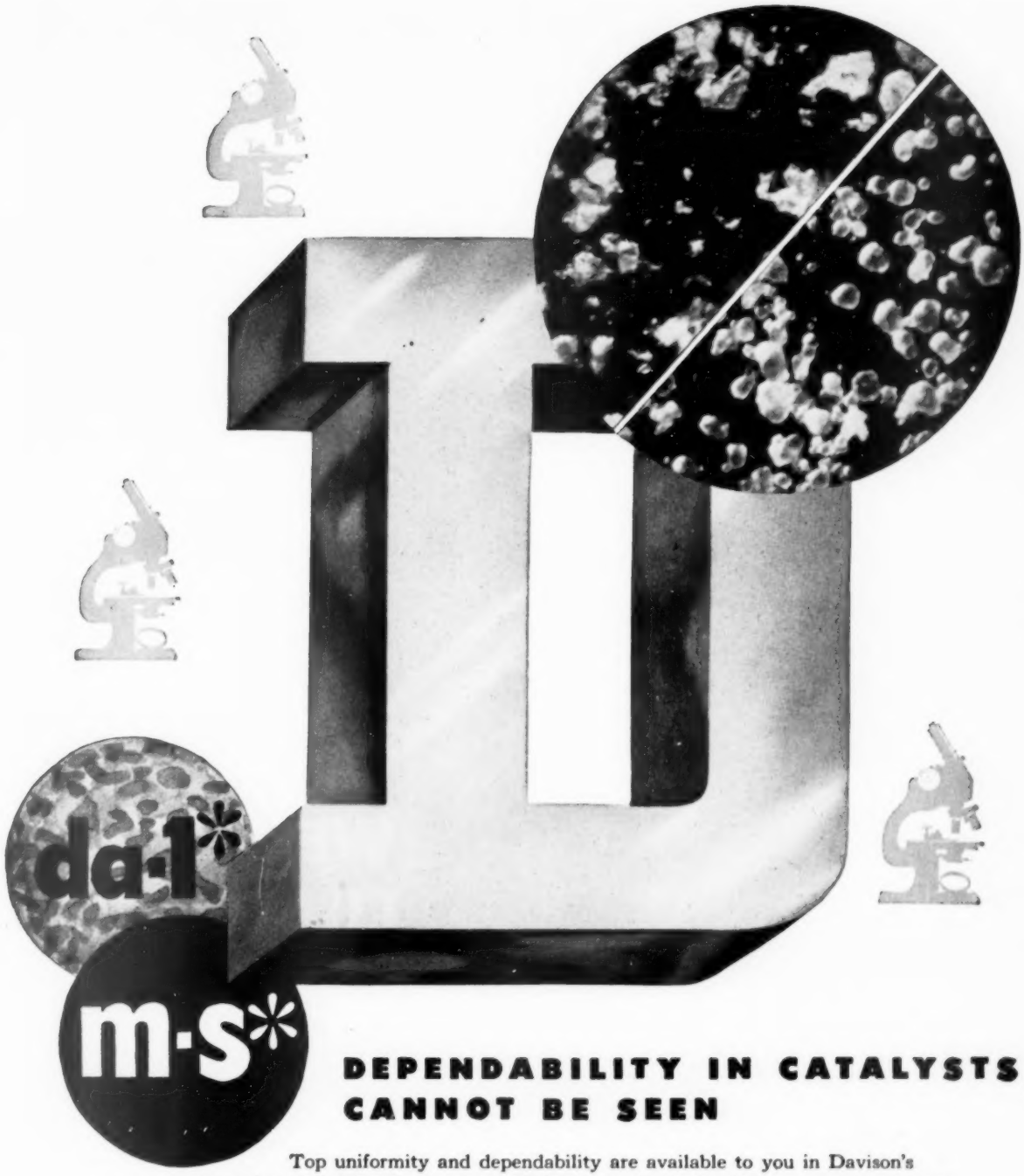

DEPENDABILITY IN CATALYSTS CANNOT BE SEEN

Top uniformity and dependability are available to you in Davison's microspheroidal (M-S*) or ground (DA-1*) synthetic fluid-type cracking catalysts. The accompanying photomicrographs show the physical characteristics of the DA-1 and new M-S catalysts produced in Davison's Cincinnati plant. Uniform physical and catalytic characteristics result from Davison's modern facilities and years of technical experience and research Experienced Davison Field Service Engineers—complete laboratory facilities—are all part of Davison Dependability—Dependability with the big "D".

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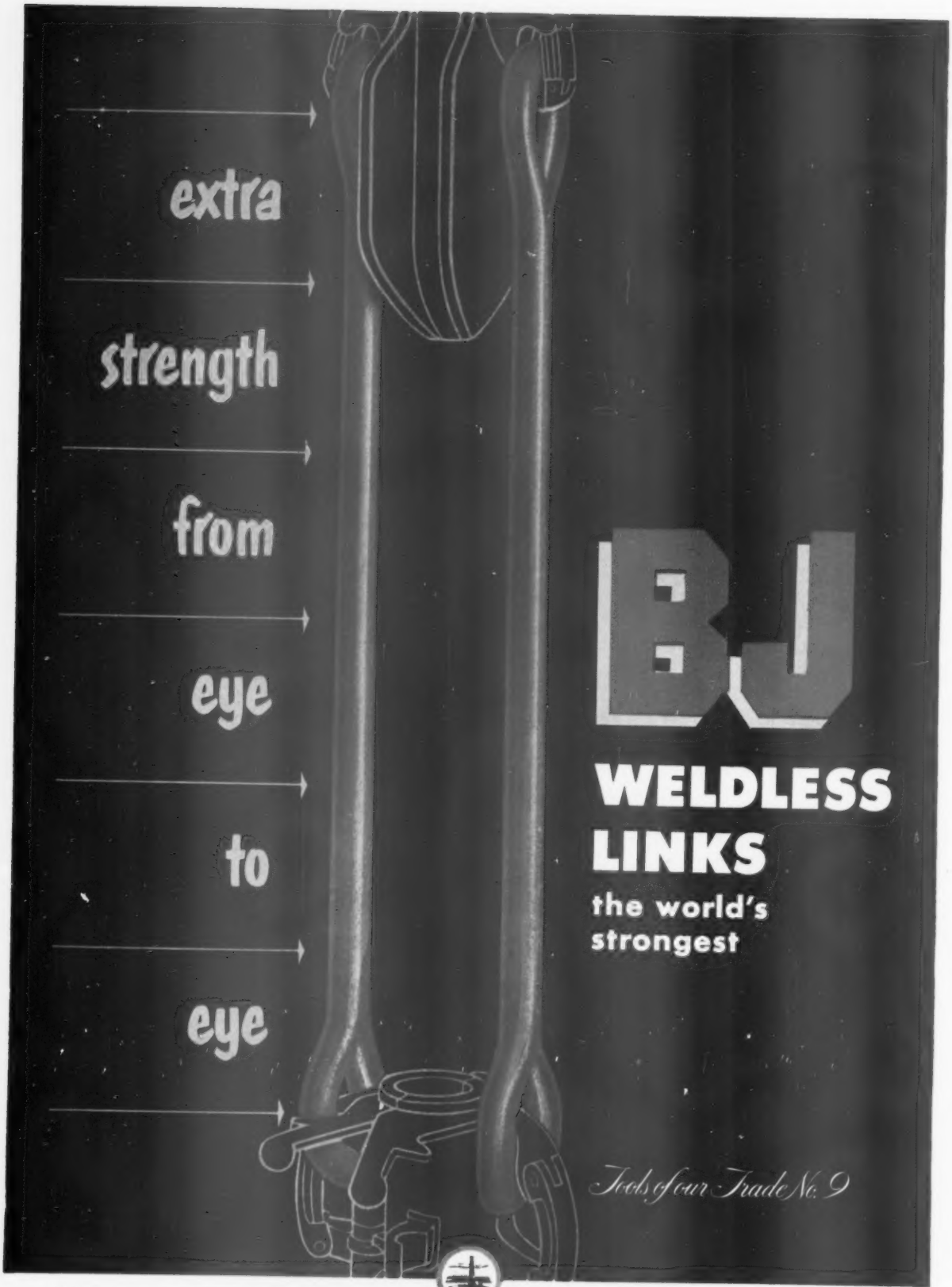
PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS



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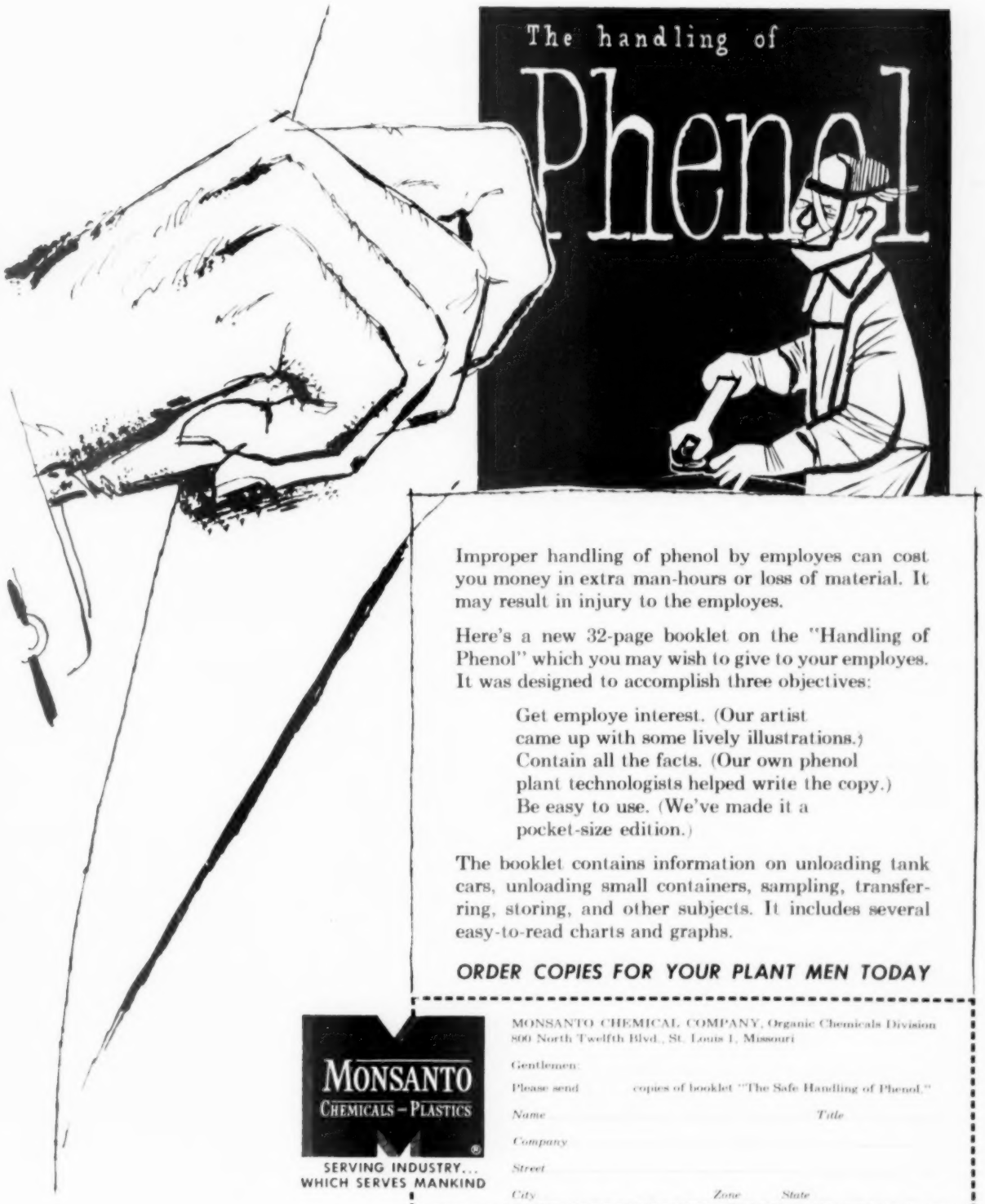
NEW PHENOL HANDLING BOOKLET HELPS YOU

Save Money...Insure Employe Safety



Improper handling of phenol by employes can cost you money in extra man-hours or loss of material. It may result in injury to the employes.

Here's a new 32-page booklet on the "Handling of Phenol" which you may wish to give to your employes. It was designed to accomplish three objectives:

Get employe interest. (Our artist came up with some lively illustrations.)
Contain all the facts. (Our own phenol plant technologists helped write the copy.)
Be easy to use. (We've made it a pocket-size edition.)

The booklet contains information on unloading tank cars, unloading small containers, sampling, transferring, storing, and other subjects. It includes several easy-to-read charts and graphs.

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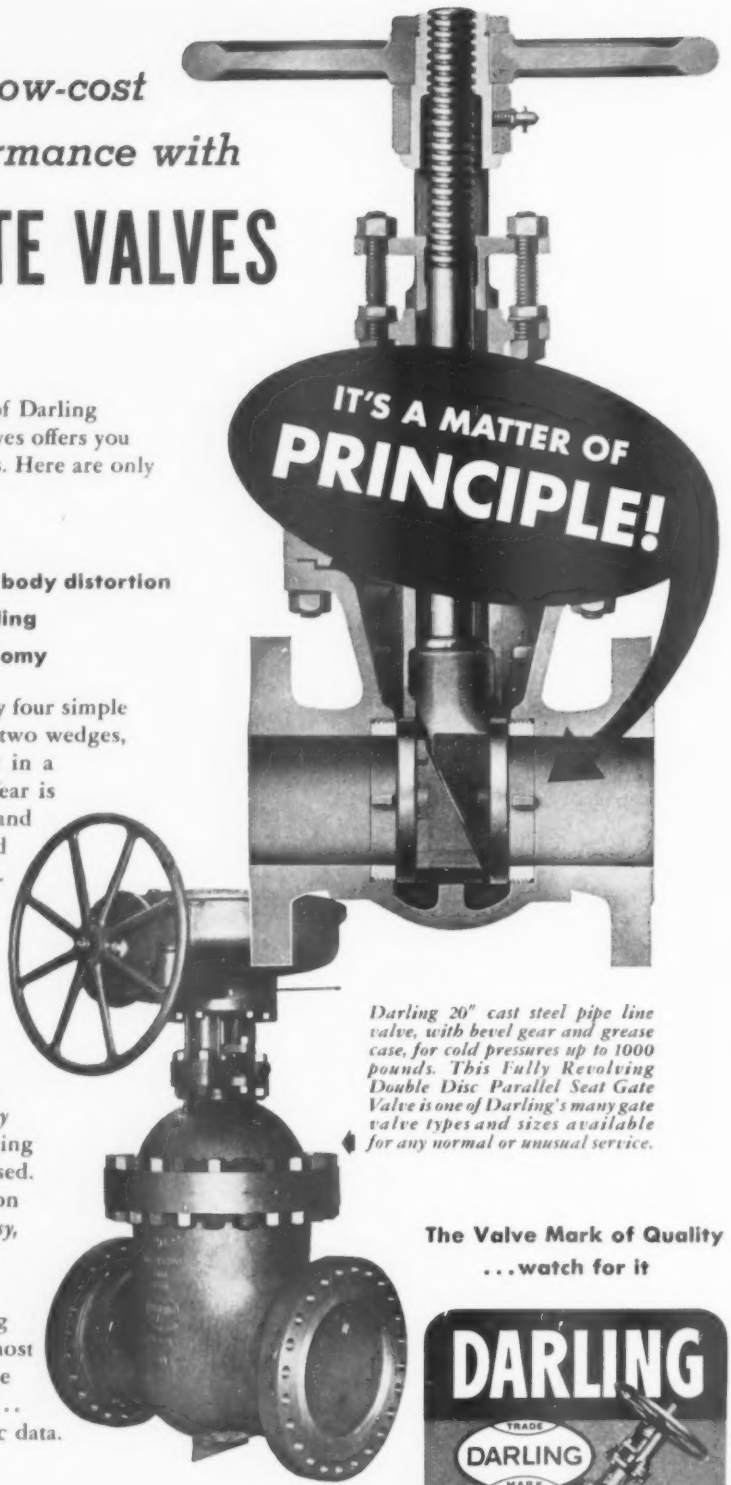
You'll cinch low-cost trouble-free performance with

DARLING PIPE LINE GATE VALVES



THE unique operating principle of Darling Revolving Double Disc Gate Valves offers you a number of cost-reducing advantages. Here are only four of the major ones . . . .

1. **Positive easy closing**
2. **Automatic adjustment for valve body distortion**
3. **Elimination of gate-to-seat galling**
4. **Unsurpassed maintenance economy**

HERE'S WHY. As shown, there are only four simple working parts in the gate assembly—two wedges, two discs free to *revolve!* Discs seat in a different position at every closing. Wear is evenly distributed, prolonging disc and seat life, minimizing maintenance and contributing to positive, tight closing.

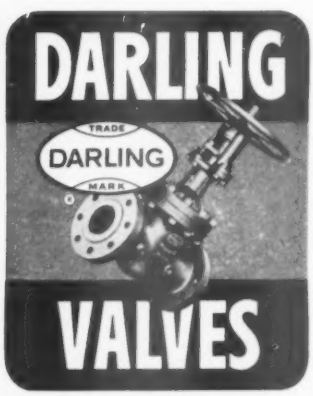
Next, note how face of upper wedge is radiused. Faces are also transverse beveled. This equalizes wedging pressure and *automatically* adjusts for valve body distortion, avoiding leaks, down-time and costly repair.

Finally, see how wedging pressure is exerted *only* when discs are *all the way down,* directly opposite seats. Wedging pressure is released *before* discs are raised. Obviously this eliminates severe friction and galling, makes valve operation *easy,* and prolongs trouble-free life of discs and seats.

There's a Darling Valve ready to bring you these and other advantages in almost any service you can name! Send for the 300-page Darling Catalog No. 17M . . . or identify your needs and get specific data.

Darling 20" cast steel pipe line valve, with bevel gear and grease case, for cold pressures up to 1000 pounds. This Fully Revolving Double Disc Parallel Seat Gate Valve is one of Darling's many gate valve types and sizes available for any normal or unusual service.

The Valve Mark of Quality
. . . watch for it



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B and W SCRATCHERS and CENTRALIZERS

For a Good Cement Job

B and W originated and pioneered the LATCH-ON-CENTRALIZER for easy installation . . . the KON-KAVE Bow for greater centering strength . . . the WALL CLEANING GUIDE . . . the MULTI-FLEX and HINGED NU-COIL SCRATCHERS FOR POSITIVE MUD REMOVAL and COMPLETE CEMENT FILL.

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B AND W KON-KAVE BOW

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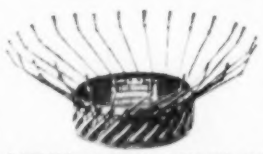

B AND W WALL CLEANING GUIDE

B AND W NU-COIL SCRATCHER

Apparatus and method of usage covered by U. S. Patents — 2,338,372; 2,374,317; 2,392,352; 2,506,405; 2,628,682; 2,634,813. Other Patents Pending.

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Where weight and space are critical

New miniature transducers expand the scope of dynamic recording systems

A BASIC PROBLEM in transducer design is reduction of size to a point where characteristics of the device under test are not affected. Two new transducers developed by Consolidated combine unusually small size and weight with operating characteristics fully comparable to previous larger instruments.

The 4-310 Pressure Pickup features a direct-sensing diaphragm and is mountable flush with any surface to avoid both volume changes in the pressure chamber and spurious turbulence patterns. It is valuable for aerodynamic pressure surveys and other high-frequency liquid or gaseous pressure measurements.

The new 4-118 Velocity Pickup is usable at high temperatures in any plane of orientation. Its output equals instruments many times its size and weight, yet it has no loading effect on structures being tested. Applications include turbine, supercharger, rocket and jet engine vibration studies.

4-310 pressure pickup

Sensitivity: 4 mv/v of applied excitation.

Ranges: 5, 15, 50, 150 psi.

Temperature range: —100°F to +250°F.

Sensitive element: 350-ohm, 4-arm resistance bridge.

Excitation: ac or dc.

Linearity and hysteresis: excellent characteristics.

Acceleration response, zero and sensitivity drift: negligible.

Versatility: usable for liquid or gas measurements.

Size: diaphragm diameter ½", length ⅝".

Complete specifications in Bulletin 1534A-X8.

4-118 velocity pickup

Output: 100 mv/in./sec. @ 250 cps.

Frequency range: linear ±10% from 50 to 500 cps over range of —65°F to +500°F.

Amplitude limits: to 0.12" peak-to-peak.

Transverse sensitivity: negligible.

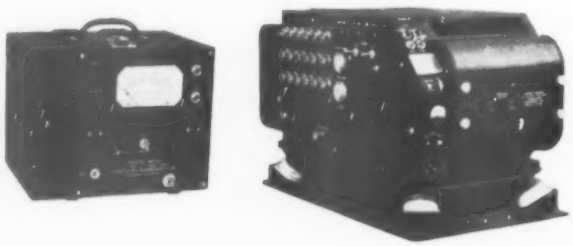
Sensitive element: self-generating, nominal 700-ohm dc coil resistance.

Total weight: 1.3 ounces.

Size: ¾" diameter, height 1".

Complete description and specifications in Bulletin 1535-X8.

Vibration can be easily, precisely measured and monitored by combining the Velocity Pickup with Consolidated's Vibration Meters, described in Bulletin 1505B.



Transient or high-frequency vibrations and pressure changes can be recorded for detailed study with Consolidated's Recording Oscillographs. Send for Bulletin 2500B.

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Miniature transducers

Consolidated's new miniature transducers, among the smallest ever designed for pressure and vibration measurement, are adaptable to the most exacting mounting requirements.

Another new Armour chemical provides protection for water flooding operations

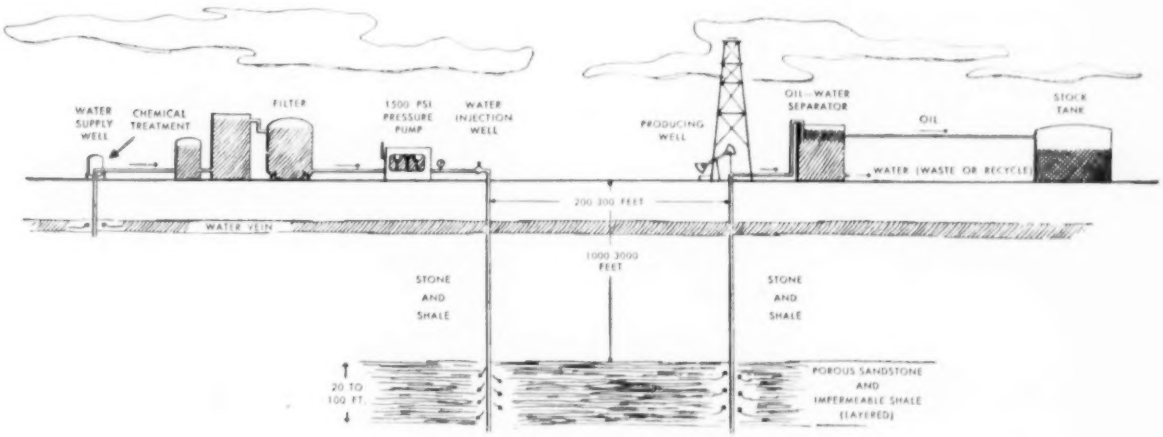
Arquad® T-2C is now available commercially for use as a corrosion inhibitor, bactericide and algaecide

The Armour Chemical Division, responsible for the development of many new chemicals for applications in the petroleum industry, has produced another corrosion inhibitor-bactericide, Arquad T-2C. This new member of the Arquad family (quaternary ammonium chlorides) provides corrosion inhibition and is extremely effective as a bacteria-controlling agent against the particularly troublesome sulphate reducing bacteria. Inhibition of the growth of this organism has been obtained at 6 to 7 ppm!

Important, too, in considering Arquad T-2C is its low cost. It is one of the most effective, and economical, corrosion inhibitors and bactericides available to the industry! For free samples for testing in your own laboratories or in the field, check and mail the coupon today! And remember that our research and development laboratory is equipped and ready to help solve customers' problems.

Samples and further information

Arquad T-2C, and our other quaternary ammonium compounds, are covered in a free booklet. Send the coupon with your letterhead for a copy of this booklet, free samples of Arquad T-2C, and Tech. Bull. E-6, "Chemical Treatment of Oil Wells," with complete technical information.



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CMH REX-FLEX

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FLEXIBLE METAL HOSE

You can stop dangerous and wasteful leakage of toxic or corrosive substances by using REX-FLEX as the flexible link in connections subject to vibration, flexation, misalignment or expansion and contraction. CMH REX-FLEX offers complete dependability even where the frequency of the motion is high. The inherent characteristics of stainless steel coupled with Flexonics' manufacturing "know-how" assure a corrosion resistant unit that will stand up in the toughest service.

When you specify REX-FLEX stainless steel hose you put to work for you a knowledge of the use of flexible stainless steel components that is unequalled. Whatever your stainless steel hose problem, it will pay you to bring it to Flexonics Corporation. For specific recommendations just send an outline of your requirements.

REX-FLEX TYPE RF-51—Sizes 3/16" through 2", I.D., for temperatures to 1,600° F working pressures to 4700 psi, with metal braid covering. Available in standard or heavy wall types. Also supplied unbraided as Type RF-50.

REX-FLEX TYPE RF-41—Sizes 1/8" through 6", I.D., for temperatures to 1,600° F working pressures to 525 psi (1 ply) and 1050 psi (2 ply); with metal braid covering. Open and close pitch types and standard and heavy wall constructions supplied. Also available unbraided as Type RF-40.

REX-WELD TYPE RW-81 (Stainless)—Sizes 1/4" through 2", I.D.; heavy wall hose for temperatures to 1,600° F, with metal braid covering. Also available unbraided as Type RW-80 (Stainless).

See our catalog in Sweet's Plant Engineering File or Chemical Engineering Catalog.

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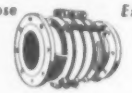
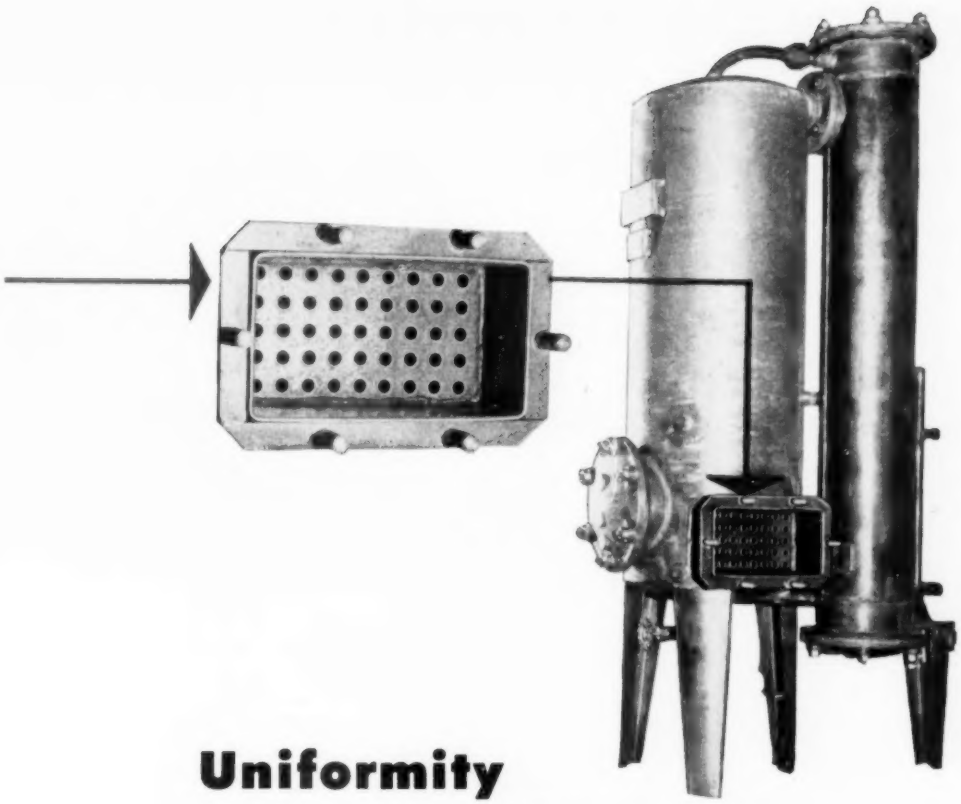


Expansion joints

Aircraft components

Metallic bellows



Uniformity helps cut tubing costs

Butler Mfg. Company of Kansas City was having trouble installing heat exchanger tubes in dry cleaning solvent recovery stills. One headache was tube concentricity. Another was the wide variation of both inside and outside diameter dimensions. Still another was the variation of physical properties.

Switching to Republic ELECTRUNITE Pressure Tubes solved the problem. Tubes are uniformly round. Because wall thickness is uniform, inside and outside diameter are concentric.

Results: Tubes slide in quickly. They expand easily with less danger of over or under-rolling. And because they are fully annealed, uniformly ductile ELECTRUNITE Pressure Tubes roll-in and bead fast . . . make tight joints . . . save time.

On your next job . . . tubing or re-tubing . . . boiler, condenser or heat exchanger . . . it will pay you to specify ELECTRUNITE Pressure Tubes. Available in carbon or Enduro Stainless Steel analyses. Write for Bulletin CEC-53.

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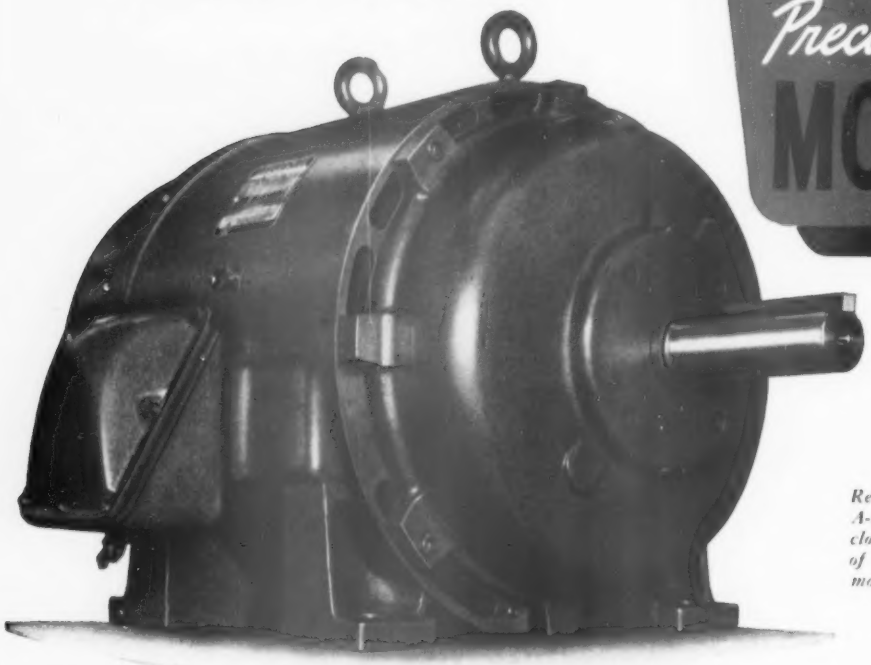
ELECTRUNITE
BOILER, CONDENSER AND HEAT EXCHANGER TUBES

ELECTRUNITE . . . THE ORIGINAL ELECTRIC WELDED BOILER TUBE

FOR RUGGED SERVICE...

"All motors are NOT alike!"

RELIANCE
Precision-Built
MOTORS



Reliance Totally-enclosed Fan-cooled A-c. Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from 3/4 to 300 hp.

- ☆ Heavy shafts, bearing to bearing
- ☆ Indestructible pressure-cast rotors
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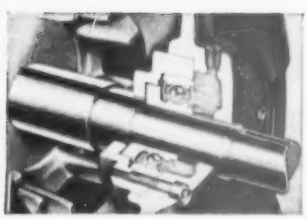

. . . AND THE BEST PRE-LUBRICATED BEARING DESIGN

The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease 'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1050-1

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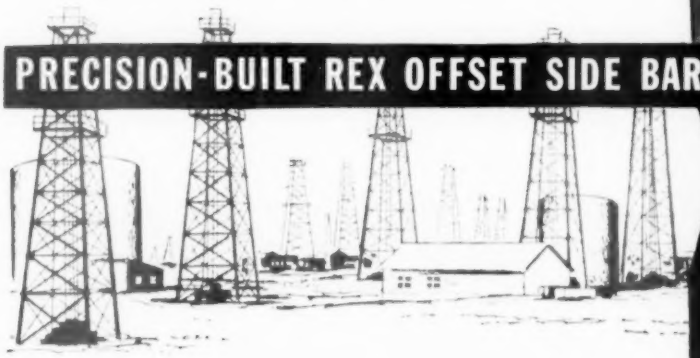
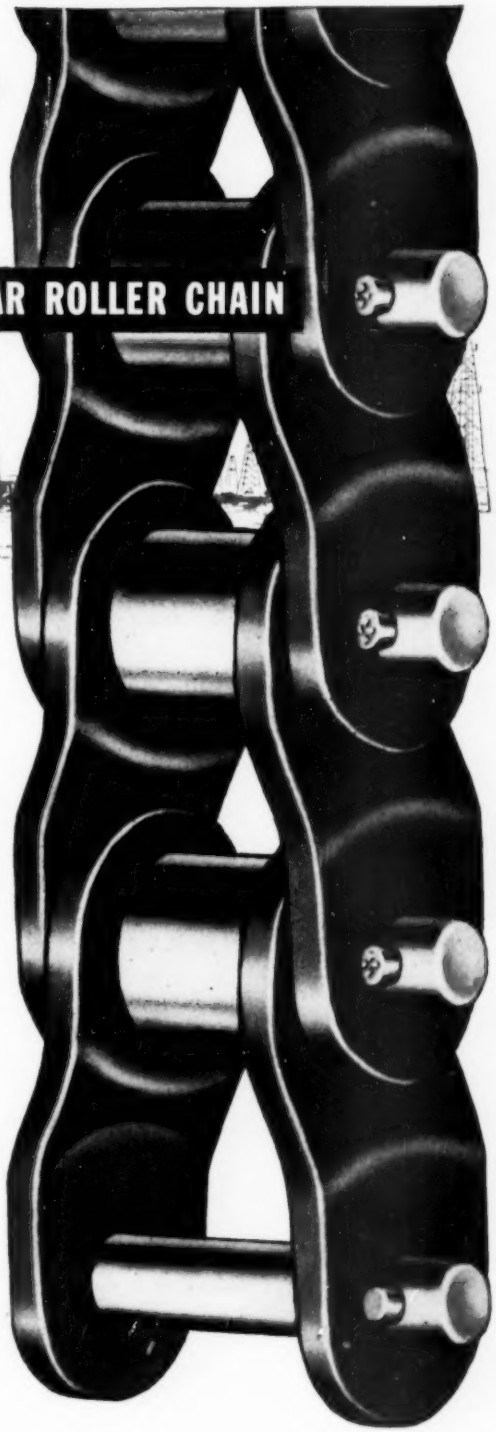
A Great OIL FIELD CHAIN

NOW BETTER THAN EVER!

PRECISION-BUILT REX OFFSET SIDE BAR ROLLER CHAIN





Rex Offset Side Bar Roller Chain, for years a favorite in the oil fields, is now better than ever. Improved materials plus the finest manufacturing techniques and heat treatment make it the ideal chain for high-speed, low-cost drilling. It is built to the same exacting tolerances and finishes as highest quality standard roller chain.

And you still get these outstanding Rex features . . .

- ★ It's built to take it . . . built-in clearances between working parts enable chain to operate under the toughest conditions.
- ★ Pins are heat-treated to resist shock loads. All parts are highly finished.
- ★ It's easy to couple and uncouple. Links exactly alike. No special coupler links to deal with. Can be lengthened or shortened by adding or removing only 1 pitch.
- ★ It comes boxed in convenient 10-foot lengths.
- ★ Runs over same sprockets as standard A.S.A. roller chain. Available from 1¼" to 2" pitch in single and multiple strands.

For all the details write for Oil Field Chain Bulletin No. 52-3. Chain Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

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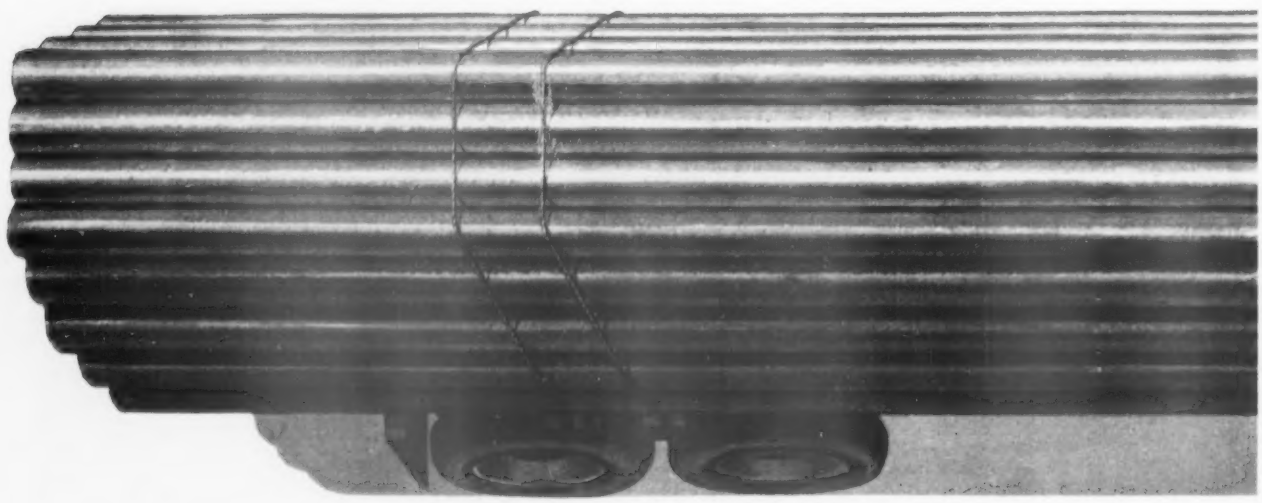
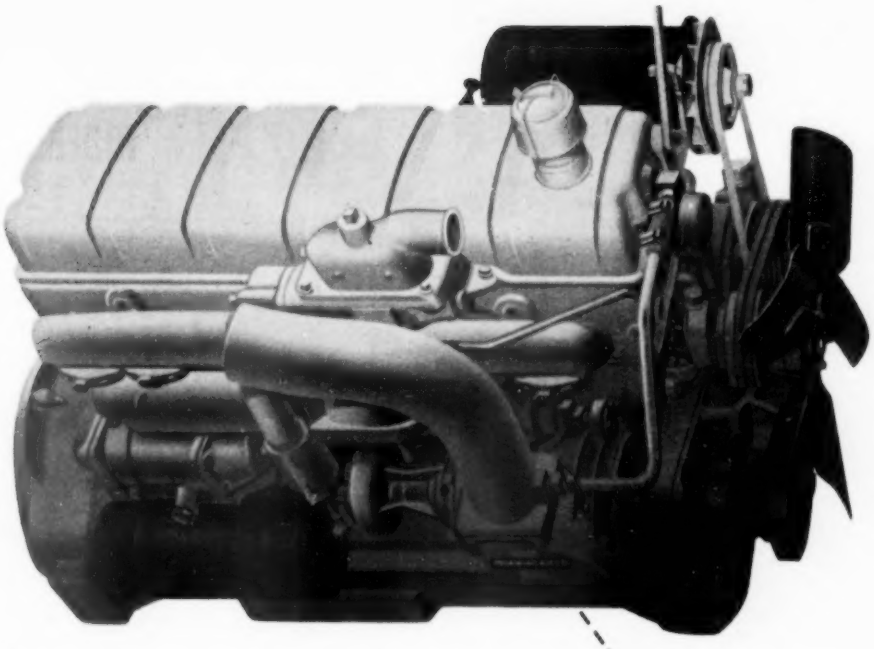
If you operate medium heavy-duty trucks ...

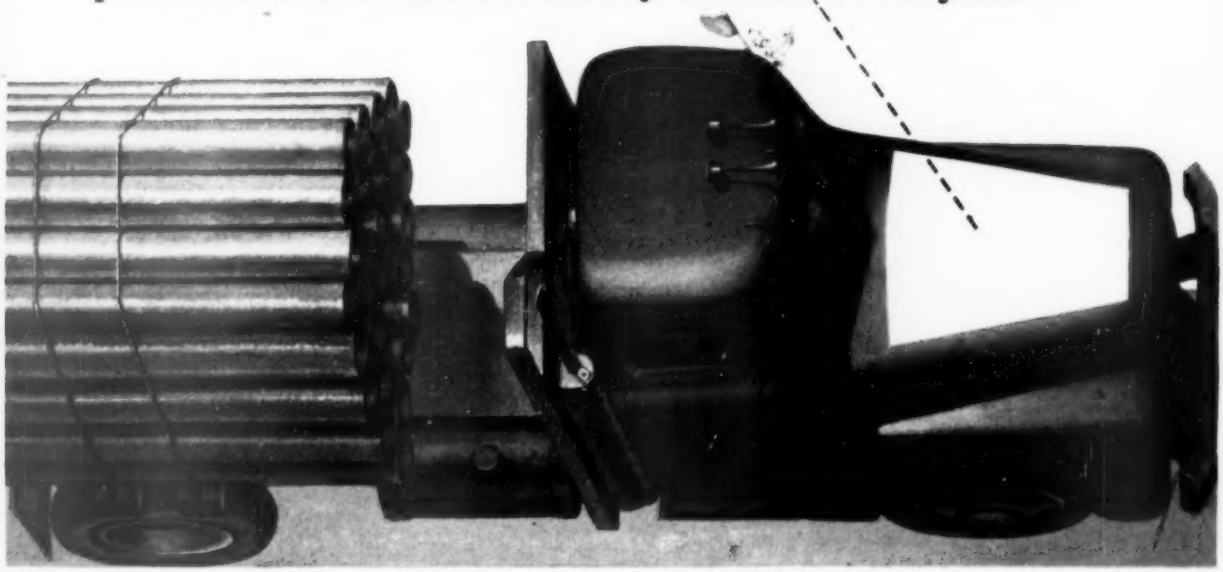
This new 150 h.p. diesel now makes Cummins



CUMMINS



performance and economy available to you



It's Cummins new Model JBS-600—ready to serve in the medium heavy-duty trucks produced by leading manufacturers. Ready to bring to this field the performance that has made Cummins the leader among high-output diesels. 150 h.p., the JBS-600 delivers full rated power for faster acceleration . . . for reserve stamina when the going is tough.

JBS-600 operators report more miles per gallon . . . lower fuel costs. This demonstrates the fact that Cummins' exclusive fuel and injection system—together with four-cycle operation and use of inexpensive Number 2 diesel fuel—naturally leads to savings on the job. The JBS-600 is ready to work profitably for you. It's Cummins-engineered for a long and useful life.

For all the facts—see your Cummins dealer!

Cummins® Engine Company, Inc. • Columbus, Indiana

Leaders in rugged, lightweight, high-speed diesel power

UNITED REFINING COMPANY marks its

50th Anniversary

...with a Blaw-Knox "Catforming" Plant

In line with its 50-year policy of using the latest refining techniques in the manufacture of premium quality products, United has commissioned Blaw-Knox Company, Chemical Plants Division, to design and construct a "Catformer" plant at their Warren, Pennsylvania refinery.

The Atlantic Refining Company "Catforming" process is an economical means for up-grading low grade naphthas to high octane gasoline at 95-100 per cent yield. The catalyst is selective and rugged; the yield-octane relationships are well established by pilot plant evaluation of numerous stocks; and commercial operations have confirmed basic design features.

Chemical Plants Division is licensed to offer Atlantic's "Catforming" process and would be pleased to discuss product yields and qualities, plant investment and operating costs with you. "Catforming" offers an economically attractive solution to your octane problem.

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
Tulsa 1, Oklahoma
Chicago 1
New York 17
Pittsburgh 22

BLAW-KNOX

DU PONT
REG. U. S. PAT. OFF.

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT
REG. U. S. PAT. OFF.

September ★ *One of a Series of Interest to the Petroleum Industry* ★ *1953*

100th ANNIVERSARY of Petroleum Research

The world's first scientific examination of crude oil was conducted by Dr. Crosby at Dartmouth College in 1853. The 100th Anniversary of this event was recently observed at Dr. Crosby's home, which also served as his laboratory.

Today, this event has far greater significance to the world than could possibly have been attached to it a century ago. From the first kerosine lamp to our modern synthetic fibers made from petroleum . . . from the first raucous chugging of the "horseless carriage" to jet airplanes that exceed the speed of sound—petroleum research has been a driving force in advancing our civilization.

Petroleum research itself has grown and progressed, too . . . from one man in a home laboratory to thousands of highly trained specialists in hundreds of modern oil and chemical industry laboratories. In the Du Pont Company alone—which makes many of its products out of petrochemicals and supplies the industry with petroleum additives—there are hundreds of specialists doing petroleum research work exclusively.

Mid-Continent District Manager

ROBERT M. GLOVER came to Du Pont from The Humble Oil Company in 1947. He was assigned to the Petroleum Chemicals Division's Mid-Continent District as a sales-service representative. In 1952 he became manager of this district.

ROBERT M. GLOVER

His experience in oil refining began in the Humble Oil Company's refinery at Baytown, Texas. There he did both field and research laboratory work. In the laboratory, he worked on solvent extraction of lubricating oils and the refining of petroleum waxes.

In 1940 he was transferred to Humble's products inspection laboratory where he directed the testing and loading of finished petroleum products into tankers, barges and tank cars.

Enlisting in the Navy in 1941, Glover was assigned to the office of the Inspector of Naval Materiel. There he supervised the acceptance of petroleum products bought by the U.S. Navy. After his discharge from the Navy in 1946, he returned to the Humble Oil Company as a product inspector.

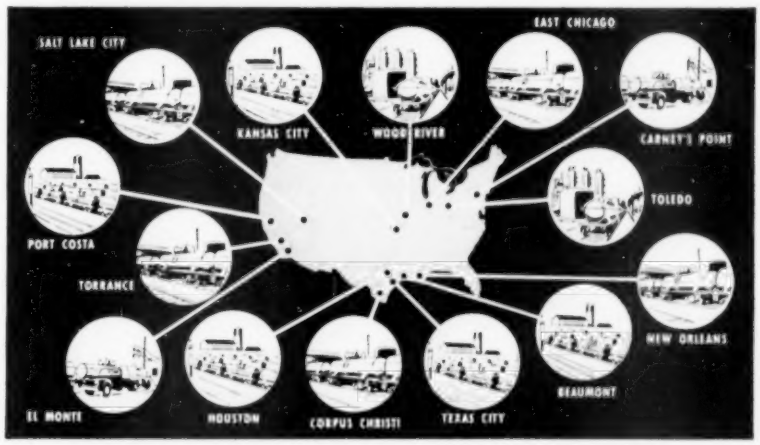
Mr. Glover received a B.S. degree in chemical engineering from Rice Institute and completed an additional year of graduate study at Massachusetts Institute of Technology.

You can count on Du Pont's 14 TEL STORAGE AREAS to Serve You in any Emergency

Strategically located rail sidings and truck facilities mean that "rush" TEL shipments can reach you in a matter of HOURS

You can now be assured of an ample supply of tetraethyl lead to meet any emergency, at any time.

To make this possible, Du Pont's Petroleum Chemicals Division maintains 14 rail sidings and tank truck terminals conveniently located adjacent to the major refining areas. And they are kept fully stocked with loaded TEL tank cars . . . ready to roll to any refinery at a moment's notice.



LOCATED near all the major refining areas, these 14 Du Pont shipping points are prepared to fill orders for TEL at any time of the day or night.

IN CASE OF EMERGENCY . . .

This extensive Du Pont distribution network was set up to help refiners meet emergency requirements for TEL which might not have been anticipated in regular delivery schedules . . . or to replace shipments which might have been held up by floods, train wrecks, strikes or other unforeseen circumstances.

NATIONWIDE SET-UP

Rapid delivery facilities are located at the following strategic points: Port Costa (San Francisco),

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED

Rapid Deliveries

Torrance and El Monte, California; Houston, Corpus Christi, Texas City and Beaumont, Texas; Salt Lake City, Utah; Kansas City, Missouri; Wood River, Illinois; East Chicago, Indiana; Toledo, Ohio; New Orleans, Louisiana; and Carney's Point, New Jersey.

The tank truck terminals at Carney's Point, N. J. and El Monte, Calif. are complete with weigh tanks and storage facilities. These make it possible for refiners to receive rush shipments of TEL in smaller-than-tank car lots.

FULLY LOADED, this TEL tank car is ready to roll to a refinery from a nearby siding on a moment's notice.

'ROUND-THE-CLOCK SERVICE

An ample supply of both Motor Mix and Aviation Mix is always on hand at all 14 shipping points. And there is someone at the phone to expedite your order at any time of the day or night. What's more, the chances are that your rush orders can be filled in a matter of a few hours—depending on the distance to your refinery.

FULLY STOCKED WAREHOUSES

In addition to the mobile units handling tetraethyl lead, Du Pont also maintains three fully-stocked warehouses in Houston, Los Angeles and Wilmington, Delaware, which carry a large supply of all other Du Pont petroleum additives.

FOR CONVENIENCE, smaller-than-tank car shipments of TEL can be sped to refineries by tank truck from El Monte, California and Carney's Point, New Jersey.

Field Tests Show Effectiveness of Du Pont Fuel Oil Additive No. 2

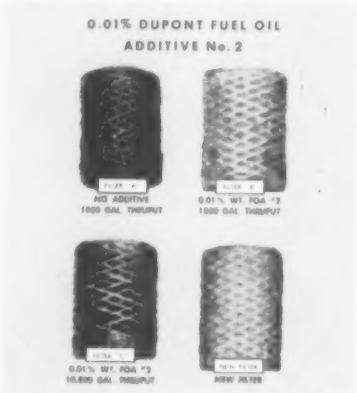
The following test, conducted by a major oil company, shows how you can reduce filter screen clogging in domestic oil burners with the new Du Pont Fuel Oil Additive No. 2.

The test was conducted under actual operating conditions during the 1951-52 heating season. The fuel used was of uncertain age and had been transported by tanker to a water terminal before the Fuel Oil Additive No. 2 was added. The fuel itself was a blend of cat-cracked and straight-run stocks having the following properties: 0.21% S; 326° F. – I.B.P.; 598° F. – 90%; 654° F. – E.P.

Approximately 70,000 barrels of this fuel were treated at a concentration of 30 pounds per 1,000 barrels during the loading of barges from shore tanks at the water terminal. The treated fuel was then delivered to another water terminal storage tank – from which it was supplied to all of the customers served by this terminal.

None of the customer burner units used in the test were given any special cleaning or reconditioning beyond the normal routine servicing. The test was continued throughout the heating season.

For a control, a similar marketing area was supplied with the same fuel—without the addition of Fuel Oil Additive No. 2.



Typical results of this test are shown in the above photograph. This shows filters used in a commercial burner consuming about 1800 gallons per month. Prior to the start of the test, this burner had required filter replacement each month. But when Du Pont Fuel Oil Additive No. 2 was added to the fuel, the filter was unusually clean and serviceable after a 10,800 gallon thruput.

LITERATURE AVAILABLE

Here is a partial listing of the bulletins, reports, booklets, movies and aids available to you through any Du Pont Petroleum Chemicals Division district office:

The Service Station and the Motorist – Report Nos. 1, 2 and 3 are now ready for distribution. Authoritative studies on gasoline buying habits in regard to service station loyalty, brand name loyalty and gasoline grade selection . . . . . Serials A-5396, A-5347 and A-5826

Du Pont Fuel Oil Additive No. 2—A 12-page bulletin describing this ashless stabilizer and dispersant which prevents clogging of fuel oil screens Serial A-5201

Pipeline on Wheels—A 26-minute, full-color movie on tank truck safety. Suitable for both training and public relations purposes.

DU PONT
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

District Offices:
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CHICAGO, ILL.—8 So. Michigan Blvd. — Phone RAndolph 6-8630
TULSA, OKLA.—1811 So. Baltimore Avenue — Phone Tulsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. — Phone PRestan 2857
LOS ANGELES, CALIF.—612 So. Flower St. — Phone MAdison 1691

IN CANADA: Canadian Industries Limited—Toronto, Ont.—Montreal, Que.—Calgary, Alta.
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Bldg., 6539—Wilmington 98, Del.

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A-5949

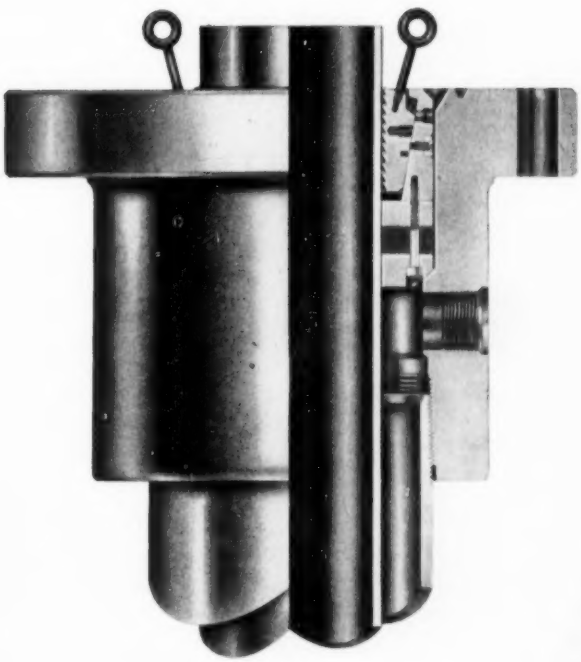
Printed in U. S. A.

here's the **new**

MIDDLEWEIGHT

champion

Ever since O-C-T pioneered the first deep well casing head that provided casing seal and suspension before blowout preventers were removed, we have recognized the need for this same safe, simplified type installation for a medium priced — medium duty casing head. Now, O-C-T research and study of casing head flexibility and safety have resulted in the introduction of this new O-C-T "C-20" Casing Head for medium depth wells. Check the features, advantages, and safety this new O-C-T head brings to the field . . . then write for the C-20 Brochure containing Engineering Nomograph for Calibrating Casing Loads and Pressures . . . Or ask your O-C-T Representative for details. Available through more than 700 supply store locations.



O-C-T C-20 CASING HEADS

THE FIRST AND ONLY QUICK-SETTING, POSITIVE-SEALING WELL HEADS DESIGNED ESPECIALLY TO ELIMINATE OPEN HOLE HAZARDS IN MEDIUM DEPTH WELLS.

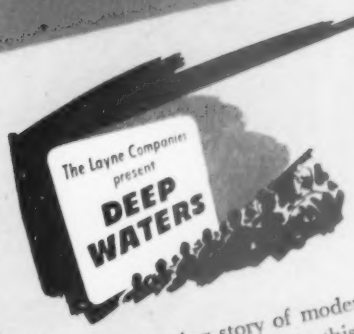
1. Seals and suspends casing before blowout preventers are removed.
2. Saves hours of costly rig time — simplifies installation.
3. Sealing element, slip bowl and slips are assembled at the O-C-T plant as a single unit that may be wrapped quickly around the casing, latched and dropped into place from the derrick floor.
4. It employs a resilient seal ring which provides an effective seal for the life of the well in any climate.

Oil Center Tool Co. P. O. Box 3091 Houston, Texas

Export Representatives: Sterling Areas — Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston 1, Texas

See this new color movie on modern water development

Interesting! Educational! Helpful!



ARRANGE FOR A SHOWING TO YOUR GROUP

The fascinating story of modern water development is unfolded before your eyes in this new 22-minute sound movie in color. Filled with dramatic action shots, "DEEP WATERS" is just as interesting to experienced water works men as it is to people who want to keep informed on engineering advances affecting our cities and industries.

LAYNE & BOWLER, INC., Memphis 8, Tenn.

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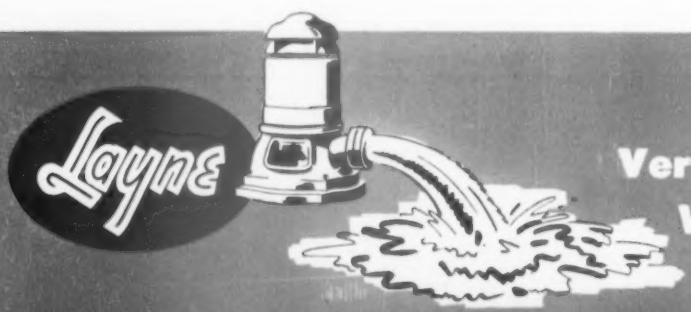

Water Wells
Vertical Turbine Pumps
Water Treatment

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You'll like the nearby, dependability of Iverson's fully-stocked supply stores, too. They are your best protection from expensive and unnecessary downtime due to equipment failure. Hundreds of different pieces of equipment from well-known oil field equipment manufacturers are always available from any Iverson Supply Store. If *your* problem is equipment for any of the different phases of drilling, production or refining, you'll find it *pays* to call Iverson first.

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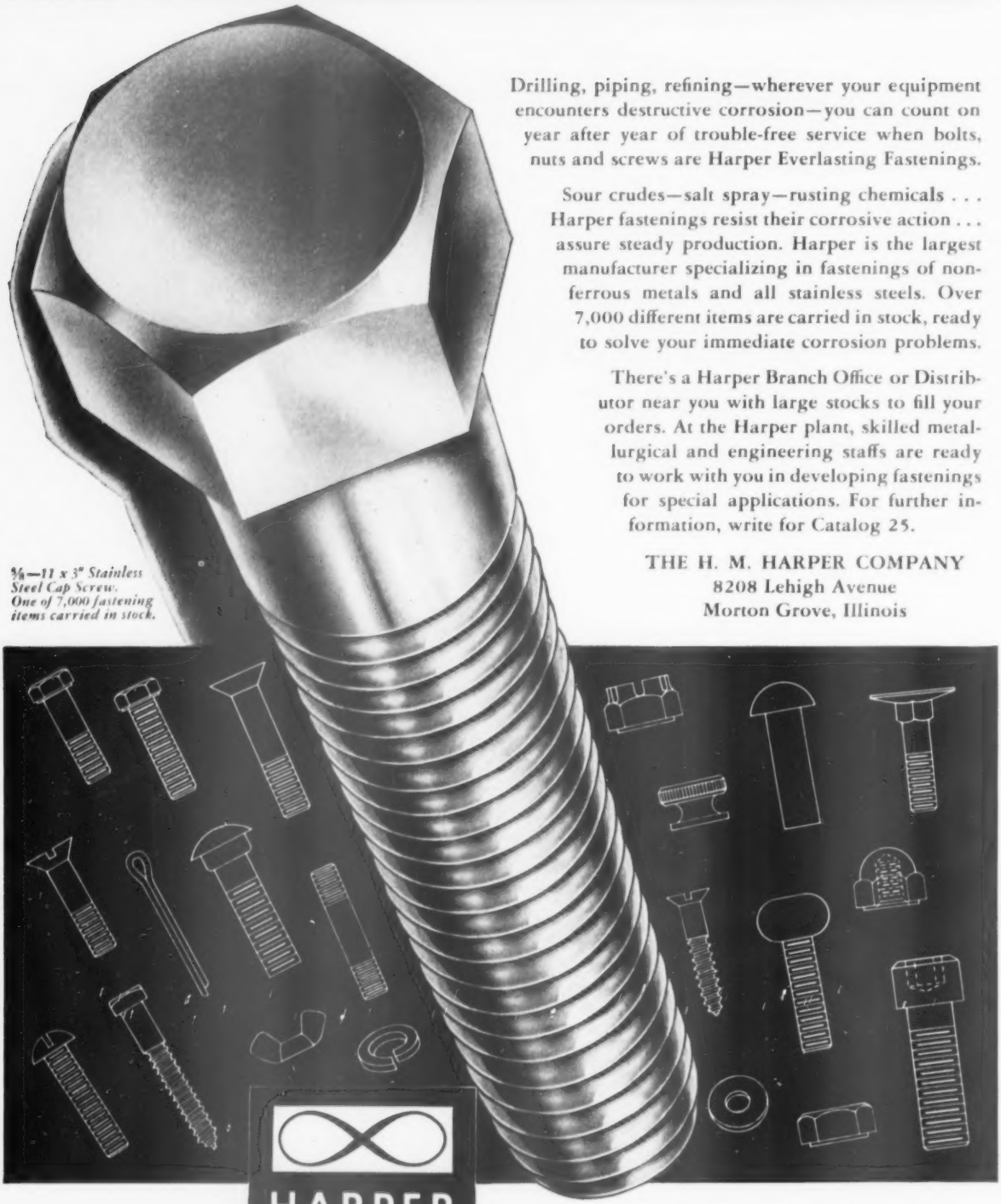
FORGET CORROSION PROBLEMS—USE HARPER FASTENINGS!



¾—11 x 3" Stainless Steel Cap Screw. One of 7,000 fastening items carried in stock.

Drilling, piping, refining—wherever your equipment encounters destructive corrosion—you can count on year after year of trouble-free service when bolts, nuts and screws are Harper Everlasting Fastenings.

Sour crudes—salt spray—rusting chemicals . . . Harper fastenings resist their corrosive action . . . assure steady production. Harper is the largest manufacturer specializing in fastenings of non-ferrous metals and all stainless steels. Over 7,000 different items are carried in stock, ready to solve your immediate corrosion problems.

There's a Harper Branch Office or Distributor near you with large stocks to fill your orders. At the Harper plant, skilled metallurgical and engineering staffs are ready to work with you in developing fastenings for special applications. For further information, write for Catalog 25.

THE H. M. HARPER COMPANY
8208 Lehigh Avenue
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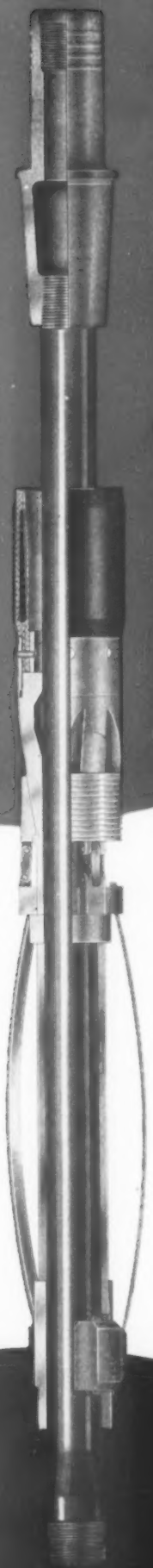
EVERLASTING FASTENINGS

SPECIALISTS IN ALL
CORROSION-RESISTANT FASTENINGS

STAINLESS STEEL · MONEL · BRASS · NAVAL BRONZE · SILICON BRONZE · NICKEL · ALUMINUM · COPPER



AMERICAN IRON'S

NEW TYPE S

Control Head Packer assures

-POSITIVE SEAL

-POSITIVE SETTING

-POSITIVE RELEASE

AT ANY DEPTH

Once you've used this new Type S Packer, you'll agree that here is the outstanding packer for extremely deep, hazardous wells! For example, even in those difficult off-center wells where the tubing rides the casing wall, this new packer is designed to set, seal and release with dependable, positive action!

You get positive seal because this Type S Packer is equipped with American Iron's specially designed, patented packer cup — used so successfully on all American Iron Packers. Heavy-duty dovetail slips provide positive setting with assured release at any depth! Feature by feature — you'll find that this new Type S Packer is the sum-total of all our many years experience in designing and manufacturing packers!

Send for special TYPE S PACKER BULLETIN now available upon request.

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OKLAHOMA CITY, OKLAHOMA • BOX 1177 • PHONE L. D. 518
DISTRICT OFFICE: HOUSTON, TEXAS
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AMERICAN IRON & MACHINE WORKS CO. MANUFACTURERS OF OIL FIELD EQUIPMENT A REG U.S. PAT. OFF. OKLAHOMA CITY U.S.A.

Eliminates Auxiliary Equipment with Portable Drilling Rigs

Ro-Flo AIR COMPRESSORS

A new air blast drilling technique developed by the Winter-Weiss Company and adaptable to all their PORTADRILL rigs uses *Ro-Flo* rotary air compressors to eliminate extensive and costly auxiliary equipment in some types of drilling operations.

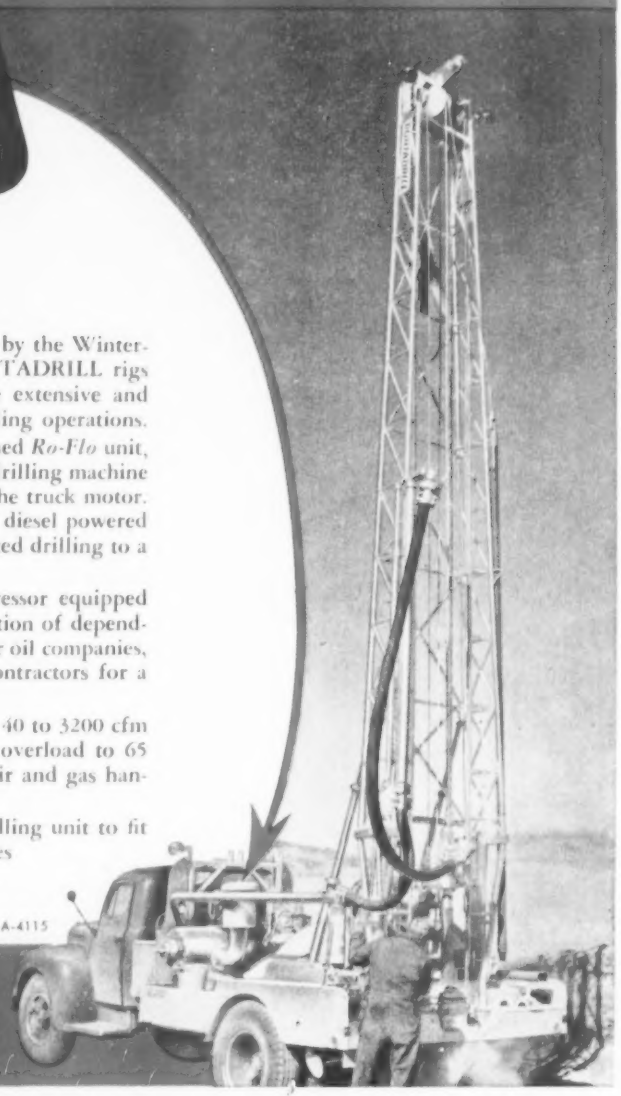
Through the use of the compact and self-contained *Ro-Flo* unit, all apparatus can be integrally mounted with the drilling machine on a single truck chassis. Power is generated by the truck motor. This elimination of a separate truck mounted and diesel powered compressor has minimized drilling costs and reduced drilling to a one unit operation.

Field expeditions with the new *Ro-Flo* compressor equipped PORTADRILL rig quickly earned for it a reputation of dependability. It has been chosen for exploration by major oil companies, geophysical organizations, and by independent contractors for a multitude of uses.

Ro-Flo compressors are built in capacities from 40 to 3200 cfm at pressures from 5 to 40 psig with momentary overload to 65 psig, and are only one of five separate types of air and gas handling units manufactured by Allis-Chalmers.

For detailed information on an air or gas handling unit to fit your particular need, contact your nearest A-C sales office or write Allis-Chalmers, Milwaukee 1, Wis.

A-4115



An air blast PORTADRILL rig using a Ro-Flo compressor on location in the Wyoming desert. Unit is drilling blast holes for strip mining.

Ro-Flo and *Texrope* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C

Power, Electrical, Processing Equipment for Petroleum Industry

TURBINE-GENERATORS | BLOWERS and COMPRESSORS | TRANS-FORMERS | UNIT SUBSTATIONS | MOTORS—*TEXROPE* DRIVES-CONTROL | CENTRIFUGAL PUMPS

They Say—

Government Monopolies Destroy Industry

". . . spirited competitive search for new deposits is the secret to the American oil industry's success. No monopoly, whether public or private, with its single and final judgment can hope to match it, and a government monopoly is the most handicapped of all. In the United States where nearly 10,000 geologists and geophysicists aid in the search for new oil or gas, only one wildcat well out of nine is a producer. What bureaucrat could afford to risk his official neck on odds like that!"

From an editorial in the Shreveport Journal.

Oil Progress, a 365-Day Affair

"I want to urge all . . . to redouble their efforts to make Oil Progress a year-around affair. Celebrating 1 week a year is all right, but we who live in the industry, know that it must be made a part of our daily stint."

Russell D. Karns, assistant to the president of Stanolind Oil & Gas Co., addressing the Oil Progress Committee of the Tulsa Chamber of Commerce.

Product Lines Almost Span Nation

"If we look at our latest pipe-line maps, we are impressed with what they can be made mean to this nation in terms of national security and emergency needs.

"So extensive has been the development, the growth and the construction of product pipe lines that it is even now physically possible, by building a connecting line from Casper . . . to Sinclair, Wyo., to move products underground by pipe line all the way from . . . Marcus Hook, Pa., to the Columbia River on the Pacific Coast via Salt Lake. Similarly, it would also be possible to deliver Texas petroleum products to the Pacific Coast."

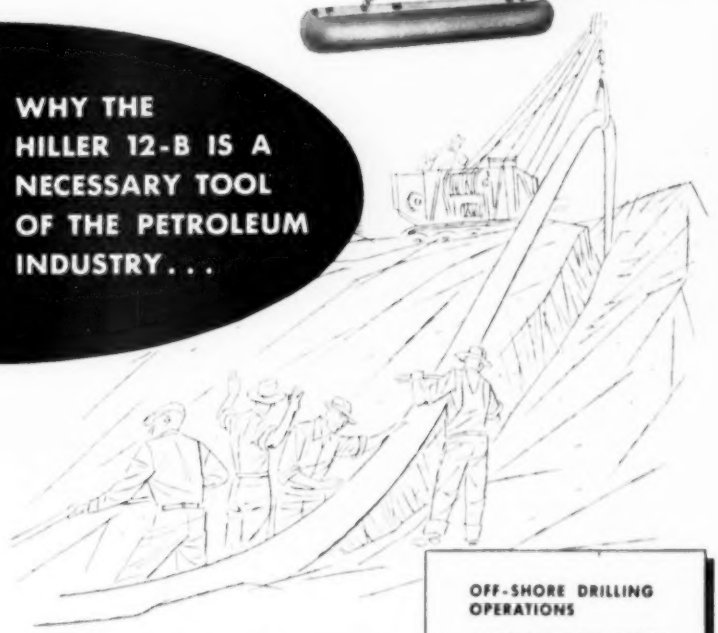
P. C. Spencer, president of Sinclair Oil Corp., speaking at the dedication of the Pioneer products line, Salt Lake City.

Iranian Oil May Hurt Market

"Mossadegh's ouster and the shah's return to power in Iran are generally interpreted as offering an opportunity for the West . . . to regain that country's friendship and bring its oil back to world trade.

"But assuming that both are satis-

WHY THE HILLER 12-B IS A NECESSARY TOOL OF THE PETROLEUM INDUSTRY . . .



Tough competition today requires that you take advantage of industry's most modern production tools to increase operational efficiency. Such a tool is the Hiller 12-B, on floats or skids . . . a helicopter which can do many jobs for you *better, faster, more economically!* Successfully proved are applications in:

- OFF-SHORE DRILLING OPERATIONS
- MAGNETOMETER WORK
- GRAVIMETER WORK
- SEISMOGRAPH WORK
- PIPE LINE SURVEY
- PIPE LINE PATROL

Because a helicopter can fly at very low speeds . . . can land and take off almost anywhere . . . can stop and stand still in the air . . . and can cruise at the speed of an average light plane, it can perform industrial functions that will greatly increase the efficiency of your operations. And because of its ruggedly built, all-metal construction, its exceptional stability, ease of control, and its 3-passenger comfort in flight, the *Hiller 12-B* is the best in the field.

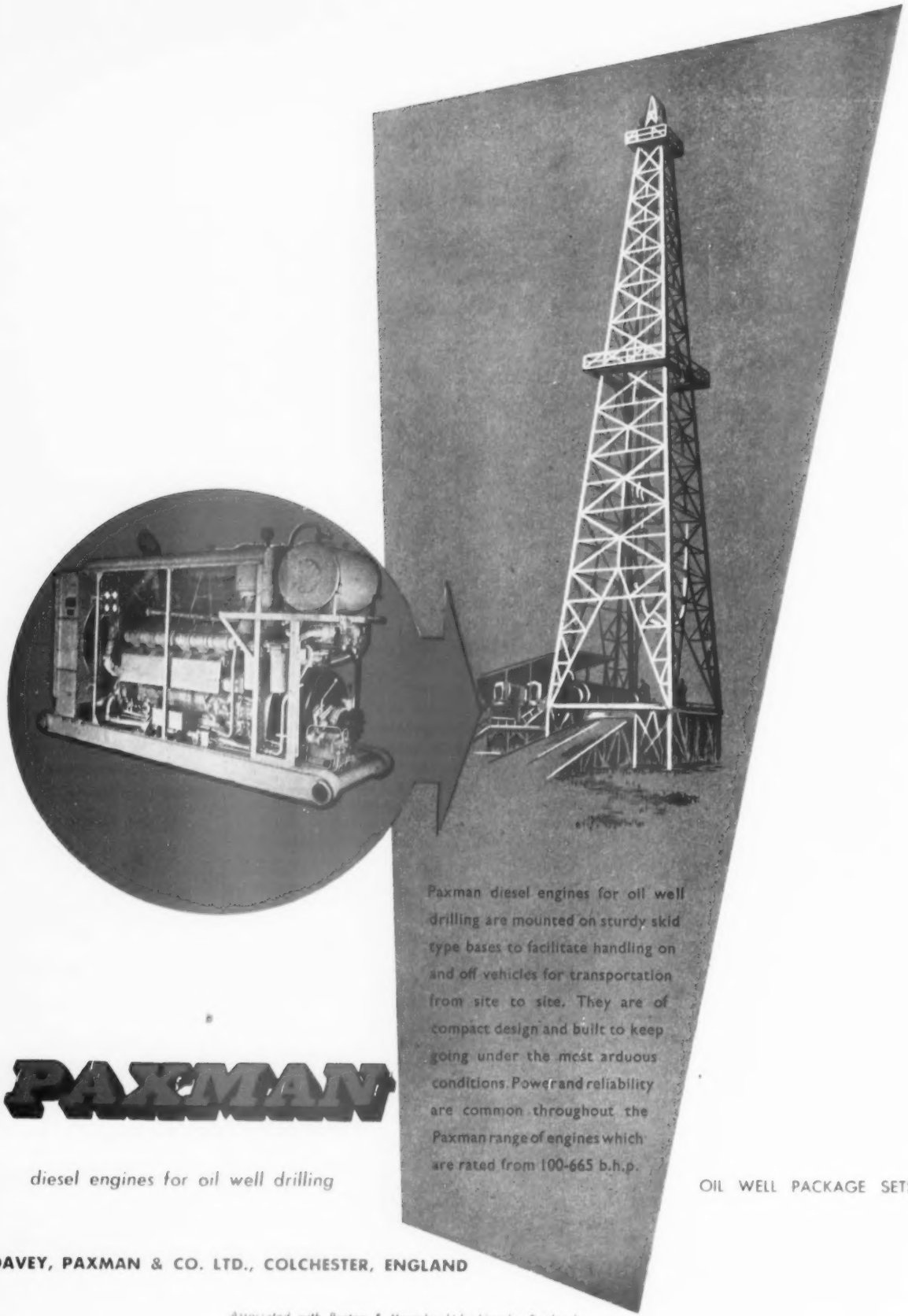
- EXPLORATION
- MATERIAL TRANSPORTATION
- PERSONAL TRANSPORTATION
- CONSTRUCTION WORK

Exclusive design features proved in more than four years of successful operation throughout the world make the Hiller 12-B the leader in its field for utility, safety, and performance.

Write or wire us today for an analysis of how you can profit by using the Hiller 12-B in your business

HILLER HELICOPTERS 1350 Willow Road Palo Alto, California

Hiller builds a better helicopter



Paxman diesel engines for oil well drilling are mounted on sturdy skid type bases to facilitate handling on and off vehicles for transportation from site to site. They are of compact design and built to keep going under the most arduous conditions. Power and reliability are common throughout the Paxman range of engines which are rated from 100-665 b.h.p.

PAXMAN

diesel engines for oil well drilling

OIL WELL PACKAGE SETS

DAVEY, PAXMAN & CO. LTD., COLCHESTER, ENGLAND

Associated with Ruston & Hornsby Ltd., Lincoln, England

factorily achieved, there is no guarantee that everything will be rosy.

"The truth is that the oil world already has adjusted itself to the absence of Iran's production. Output of oil has been stepped up in other producing areas, notably along the Persian Gulf, to offset the loss of Iranian oil. The 30 million tons that country is capable of producing could have a very unsettling effect if brought back into the market. It could cause a cutback in countries neighboring to Iran, and bring trouble with the shieks of those lands if their fat royalty checks are suddenly decreased. It could pour a heavy additional volume of foreign oil into the United States and raise anew the threat of disruption of a vital domestic industry by unlimited imports."

Editorial in the Fort Worth Star-Telegram.

Defense Cutback Offers Challenge

"I believe that any reduction in defense spending is going to provide the best possible opportunity for industry to generate, within itself, many uses for our already enormous and steadily increasing productive capacity.

"Private industry's big job for years to come is to prove to itself and to the world that it can continue to raise living standards in the United States."

Dr. Leland I. Doan, president of Dow Chemical Co., addressing the annual stockholders meeting, Midland, Mich.

Taxes Hinder Foreign Ventures

"The prospective tax burden is one of the risks to be considered in deciding whether or not utilize American private capital in the establishing or in the expansion of a business enterprise abroad. Added to other risks involved in connection with countries where the general political and economic situation may not be as promising as could be desired, the likelihood of encountering tax liabilities, foreign and American, of a onerous nature may be the determining factor in reaching a negative decision regarding an investment prospect. When it becomes necessary, as it often does, to take into account the competition offered by enterprises owned domestically within a host country, and perhaps even more so the competition of enterprises with third country ownership, the question of taxation is again highly important. American private enterprise funds available for investment find within our own country a great multitude of opportunities for utilization. The political and economic risks of keeping money at home for investment in United States enterprises are not as

YOUR PROFIT-BUILDING ANSWER TO...

HEAT and CORROSION

ESCO "Assured Analysis" High Alloy Castings

The Spectrograph above verifies the correct chemical composition in every ESCO casting. This modern equipment does in 30 minutes what six metallurgists, using older methods of analysis, formerly accomplished in one day.

YOUR OPERATING COSTS WILL DROP WITH ESCO CASTINGS IN YOUR TROUBLE SPOTS

A Wide Range of ESCO High Alloy Products available for critical conditions of Heat and Corrosion.

- Pipe and Flanges
- Heavy-duty Valves
- Standard and Special-Flanged Fittings
- Welded Fittings
- Screwed Fittings
- Kiln Cooler and Roaster Parts
- Refinery Castings
- Heat-Treating Parts
- Conveyor Chains

When you install *ESCO* castings in the critical heat or corrosion areas of your plant, you'll be surprised at the lower maintenance—the *much longer* life—of an *ESCO* engineered and produced high alloy casting.

There are 3 good reasons for the exceptionally high endurance of *ESCO* castings:

(1) *ESCO* maintains a constant program of metallurgical research on how to combat heat and corrosion.

(2) *ESCO* maintains one of the most intensive and modern quality control programs of any foundry.

(3) *ESCO*'s Engineering Service determines the right alloy for your specific problem.

ESCO Services and Products are ready to help you realize more profit from your plant. Whether you need a single fitting or a complete operating unit—*ESCO* engineers will be glad to make a recommendation. Write today, giving full details—or ask for Catalog 175, which contains informative data on heat and corrosion.

ESCO

Offices and Warehouses: Honolulu, Hawaii; Houston, Texas; New York, New York; Los Angeles, San Francisco, California; Seattle, Spokane, Washington; Centralia, Pennsylvania; Eugene, Medford, Oregon; Salt Lake City, Utah. In Canada: Vancouver, B. C., and Toronto, Ontario.

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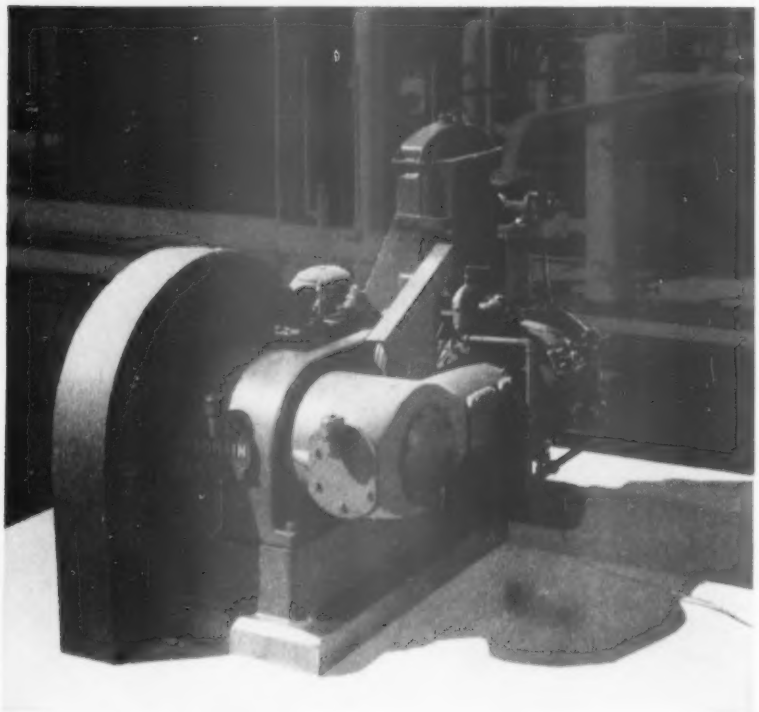

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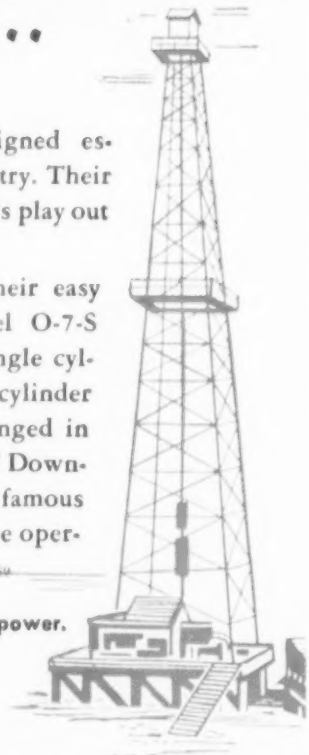

WHITE-ROTH *Machine Corp.* LORAIN, OHIO

extensive, by and large, as the risks of going abroad. Some additional incentive, such as possibility of larger profits or ability to retain a bigger share of earnings through favorable tax treatment, appears to be a requirement of substantially enlarging the outflow of private investment capital from the United States."

A statement released by George F. James, chairman of the National Foreign Trade Council Tax Committee, and a director of Standard-Vacuum Oil Co., New York.

CALENDAR OF EVENTS

SEPTEMBER

15-16 American Petroleum Institute, executive committee, Greenbrier Hotel, White Sulphur Springs, W. Va.

16-18 National Petroleum Association, annual meeting, Hotel Traymore, Atlantic City, N. J.

21-22 Natural Gasoline Association of America, fractional analysis seminar, Texas Hotel, Fort Worth.

21-25 Instrument Society of America, national instrument conference and exhibit, Sherman and Morrison hotels, Chicago.

22-25 Corrosion short course, Texas A. & M. College, College Station, Tex.

24-25 Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper, Wyo.

27-30 American Society of Mechanical Engineers, annual conference, petroleum division, Rice Hotel, Houston.

Sept. 27-Oct. 2 American Society for Testing Materials, Committee D-2 on petroleum products and lubricants, Shoreham Hotel, Washington, D. C.

28-30 American Society of Mechanical Engineers, Petroleum Division, annual conference, Rice Hotel, Houston.

28-29 Independent Natural Gas Association of America, Shamrock Hotel, Houston.

Sept. 30-Oct. 2. American Association of Petroleum Geologists, Mid-Continent regional meeting, Masonic Building, Wichita.

Sept. 30-Oct. 2 National Association of Corrosion Engineers, Permian Basin section, biannual field tour, Lincoln Hotel, Odessa, Tex.

OCTOBER

1- 2 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

4- 6 American Association of Oilwell Drilling Contractors, thirteenth annual meeting, Cosmopolitan Hotel, Denver.

5- 7 Petroleum Electric Power Association, silver anniversary meeting, Muehlbach Hotel, Kansas City.

6- 7 Texas Mid-Continent Oil and Gas Association Rice Hotel, Houston.

7- 9 National Association of Corrosion Engineers, south central region, Mayo Hotel, Tulsa.

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From this new Magcobar plant at Brownsville, Texas, now comes additional production of Magcobar Heavy Mud Weight to meet the increased needs of the oil industry. You can be *sure* of the quality . . . at fair and reasonable prices . . . when it's in the Magcobar bag. Magcobar products are available day or night through nearly 400 strategically located dealers from border-to-border, coast-to-coast.

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- FIBER SEAL
- MAGCO FIBER
- LEATHER-FLOC
- MAGCO MICA
- JEL-OIL MUD
- JEL-OIL "E"
- "E" CONCENTRATE
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8- 9	California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.
11-17	Oil Progress Week.
12-16	Short course on cathodic protection, University of Illinois, Urbana.
16-18	New Mexico Geological Society, fourth annual field conference, El Paso, Tex.
19-21	American Institute of Mining and Metallurgical Engineers, petroleum branch, fall meeting, Dallas.
19-20	Independent Petroleum Association of America, annual meeting, Texas Hotel, Fort Worth.
19-23	National Safety Congress, annual meeting, Hotels Conrad Hilton, Congress, Harrison, and Sheraton, Chicago.
21-23	Gulf Coast Association of Geological Societies, third annual convention, Captain Shreve Hotel, Shreveport.
22	American Institute of Chemical Engineers, New York section, symposium, Hotel New Yorker, New York.
22-23	Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.
23	Natural Gasoline Association of America, regional meeting, Blackstone Hotel, Tyler, Tex.
26-29	American Gas Association, annual conference, Kiel Auditorium, St. Louis.
26-28	National Lubricating Grease Institute, Edgewater Beach Hotel, Chicago.
27	Institute of Gas Technology, annual meeting, Chase Hotel, St. Louis.
27	Association of Consulting Chemists and Chemical Engineers, Inc., annual meeting, Hotel Belmont Plaza, New York City.
28-30	Seventeenth Technical Conference on Petroleum Production, Mineral Industries Building, Pennsylvania State College, State College, Pa.
29-31	Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

NOVEMBER

3- 4	Society of Automotive Engineers, national diesel-engine meeting, Conrad Hilton Hotel, Chicago.
5- 6	Society of Automotive Engineers, national fuels and lubricants meeting, Conrad Hilton Hotel, Chicago.
5- 6	American Association of Petroleum Geologists, Pacific section annual meeting, Hotel Biltmore, Los Angeles.
9-11	Geological Society of America, annual meeting, Royal York Hotel, Toronto, Ont.
9-12	American Petroleum Institute, annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.
12-13	Society of Exploration Geophysicists, midwestern meeting, Adolphus Hotel, Dallas.
19-20	National Association of Corrosion Engineers, western region, fall conference, Biltmore Hotel, Los Angeles.
19-20	Annual Instrument Short Course, Los Angeles Harbor Junior College, applied technology division, Wilmington, Calif.
20	Natural Gasoline Association of America, regional meeting, Herring Hotel, Amarillo, Tex.
Nov. 29-Dec. 2	American Society of Mechanical Engineers, Statler Hotel, New York City.

DECEMBER

1- 4	Corrosion conference, University of Oklahoma, Norman.
13-16	American Institute of Chemical Engineers, annual meeting, Hotel Jefferson, St. Louis.

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THE OIL AND GAS
JOURNAL
TULSA, OKLAHOMA

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JOURNALLY Speaking

Pirate Students

OUT in Costa Mesa, Calif., there's an outfit, aptly named Pirate Petroleum Co., which is drilling a well intermittently but with no intention of ever striking oil, which issues worthless stock certificates, negotiates fake leases, and gets out glowing prospectuses and financing plans entirely unsupported by genuine investments or properties.

Things like that used to be all too common in the early days of oil, before the Securities and Exchange Commission got on the job. How come this outfit gets away with it? Because it comes under the heading of college education for future oil men. It's part of the petroleum course at Orange Coast College.

Pirate Petroleum Co. never actually sells any stock, the land described in its leases can't be found on any map, and the plans for field development and pipe lines never get off paper. But the students who operate this dummy corporation learn plenty about the oil business. Then, a couple of afternoons a week, they get out on the company's one rig and make a few feet of hole. There's nothing imaginary about the rig, as it is complete with all standard equipment. The crew gets the bit down about 1,500 ft. in the course of a school year.

The next fall the company is reorganized, the rig is skidded to a new location on the campus, and another generation of future oil men starts learning the business. The failure of Pirate Petroleum Co. ever to strike oil or make a profit ought to condition the students to some of the hazards they will encounter when they get out in the cold, cruel world.

TV, 3-D, and Oil

TELEVISION now looms as a potential menace to the prosperity of the oil industry. At least that's the inference we draw from an article on the furniture industry we recently ran across in a business publication. It seems that per capita purchases of furniture have been very low ever since the 1920's, and the blame was attributed to the popularity of the automobile. People rode around in their cars instead of sitting home wearing out their furniture.

Now, according to this article, furniture sales are booming again, and the credit is given to television. People are staying home, entertaining their friends with TV, and wearing out their furniture. If this is so it must mean that they are buying less gasoline—and there goes the bottom out of the oil market. The movie industry, first to be hit by this TV menace, is trying to woo customers back with three-dimensional films, so now it's up to the oil industry to develop a gasoline with the equivalent of 3-D appeal.

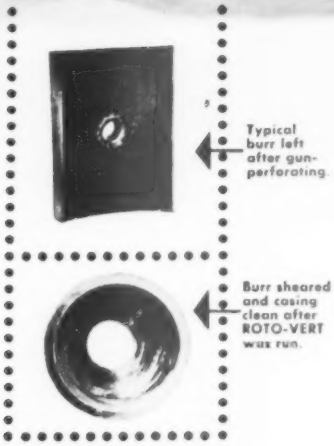
Check the Forecast

IT isn't quite time yet for the woolly bears of the Mohawk Valley to tell the oil industry how much heating oil will be needed next winter, but a glance at the gasoline production and stock figures in the statistics section toward the back of this issue may give a clue to the efficacy of a new method of predicting the oil industry's summertime business which was suggested last spring by an official of Shell Oil Co.

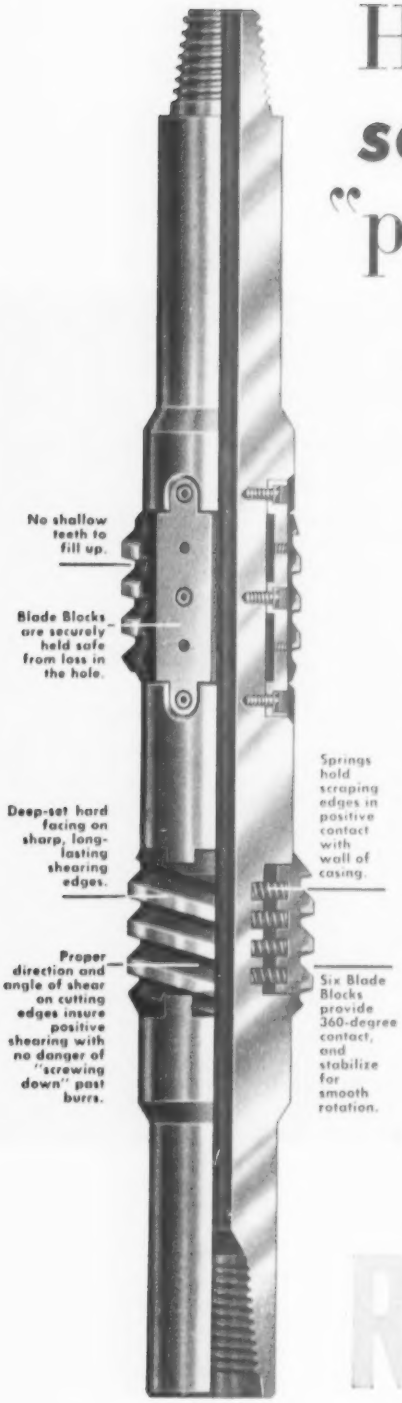
On the basis of the number of advance requests for road maps and other touring information, he predicted that more people would take more and longer automobile trips than ever before—indicating an unprecedented demand for gasoline. He attributed this to the fact that so many people now get 3-week paid vacations. However, if most people are like some we know, many a grand tour planned in the spring never materializes.

Now check the figures on gasoline use and judge how good the road-map demand is as a forecaster of motor-fuel demand. Last fall the woolly bears, those furry caterpillars whose stripes are supposed to foretell winter weather, misled the oil industry miserably. Let's hope the road-map readers were more reliable.

Henry D. Ralph



Here's why
SCRAPING YOUR CASING "pays off"


No shallow teeth to fill up.
Blade Blocks are securely held safe from loss in the hole.
Springs hold scraping edges in positive contact with wall of casing.
Deep-set hard facing on sharp, long-lasting shearing edges.
Proper direction and angle of shear on cutting edges insure positive shearing with no danger of "screwing down" past burrs.
Six Blade Blocks provide 360-degree contact, and stabilize for smooth rotation.

Unless the inside of your casing—the vital "working surface"—is clean and smooth, there is always a possibility of trouble in future operations. Burrs from gun-shot perforations, hardened cement or mud, and even mill scale are all dangerous when the time comes to run testers or swabs, or to set retainers or packers of any description.

The Baker Model "C" ROTO-VERT Casing Scraper removes undesirable obstructions from the inside of the casing, leaving it clean and smooth. Burrs or imbedded bullets are sheared away; cement, mud and scale are scraped away, so that any down-hole work can be safely done at once, or during the years to come.

SCRAPE WHILE DRILLING OUT

The ideal time to use the ROTO-VERT Casing Scraper is during the drilling out of cement, at which time it is run as a "follow-up" behind the bit. Thus in a single run you can also remove all hardened cement, mud, burrs and scale which might later damage swabs or testers, and cause packers or retainers to set prematurely—or never set at all.

EASY TO RUN—LOW-COST RENTAL

The Baker ROTO-VERT Casing Scraper is simple to run, and will effectively clean the inside of the casing *when either rotated or reciprocated* (vertical action). No service man is required, and the low rental cost is paid for many times over by freedom from future damage to bailers, swab rubbers and packers, as well as by the elimination of future delays and re-running expense.

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PRODUCT NO. 620-C

Time to stop, look, and listen

MID-SEPTEMBER is always the time for the oil industry to stop, look, and listen. This September there are an unusual number of danger signals flashing.

The danger is that the industry may have been running a bit too fast for safety. The roadbed ahead looks a little rough. Supply could outrun demand and crash into excessive inventories, scattering distress products over the landscape and wrecking orderly marketing.

The danger signals are clearly evident in the industry's current statistics. Crude production and imports are high, and refinery runs are high. But stocks of crude are high, too, and so are stocks of refined products. And the relationship between output and inventories is the measure of the rate of consumption.

SEPTEMBER is the time to check the course and make adjustments because it is between seasons—the end of the big motoring season and the start of the heating season. Gasoline consumption has been good this year, but not good enough to justify the high rate of output, with the result that the stock level has remained almost stationary for 2 months and is now higher than at the beginning of the buildup last January.

Now is the time for refiners to shift yields away from gasoline and toward heating oils. But distillate stocks already are almost as high as the peak of last November. Winter weather is always an uncertain factor, but the nation's refining capacity is ample to meet any weather emergency without the need for such a huge backlog of inventories.

Quite obviously, refinery runs are too high for this season, for it is uneconomic for the industry to carry unnecessarily high inventories of finished products. A few refiners have recently announced cutbacks in output, but much more adjustment to realities is needed.

BUT look at the crude situation. An excess of crude invites excessive refinery runs. Crude-oil stocks have been rising all year and are now close to the artificial peak caused by the refinery strike of May 1952. Domestic crude production has been climbing steadily since April; in August it was at a new high for the year and inching toward the all-time peak. And there are indications that imports, which have been high all year, are scheduled to rise even more this fall.

Unless the entire industry heeds these danger signals and eases up on the throttle, it may run into a critical period this winter such as it faced last winter. A relatively small adjustment, percentagewise, is all that is needed to insure stability. It should be shared equally by all producing areas both foreign and domestic, as well as by refiners.

Shooting for Production

Welex Jet Services Inc. Photo

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● A perforating gun entering the casing — familiar sight in the Oil Fields — is a reminder that, when you shoot for production, the properties and performance of the cement behind that casing are of key importance.

Lone Star shoots for production, too—for oil-field production — by engineering into its Oil Well Cements the properties required to assure strong, dense, long-lasting shut-offs under any given set of conditions.

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THIS WEEK

WHAT IT TAKES to build a big refinery is illustrated to some extent in this shot of one of the construction camps for Anglo-Iranian Oil Co.'s new 100,000-bbl. plant at Aden—the biggest refining project now building. When the peak construction period is reached sometime near the end of this year, roughly 14,000 men will be working at the site. The magnitude of the supply problem confronting A.I.O.C. is indicated by the fact that company must import 1,000 tons of food a month for the labor force. The camp shown here accommodates 1,500 workers from Britain, the United States, and Continental Europe. In the foreground is a 150-bed hospital, complete with surgery and X-ray and dental units. An article on construction progress at the big refinery on the southern tip of the Arabian Peninsula may be found on page 94.

EXPLORATION.—Ohio's Paloma field wildcat nears 20,800 ft. after surviving twistoff and fishing job at record depth. . . . Test, looking for Eocene production, may be bottomed in another 200 ft. . . . ¶A series of wildcats will be drilled in eastern Georgia in a program backed by several major companies, according to Gov. Herman Talmadge. . . . ¶Sinclair abandons deep wildcat in Key Largo, Fla., after four drill-stem tests below 9,500 ft. recover salt water. . . .

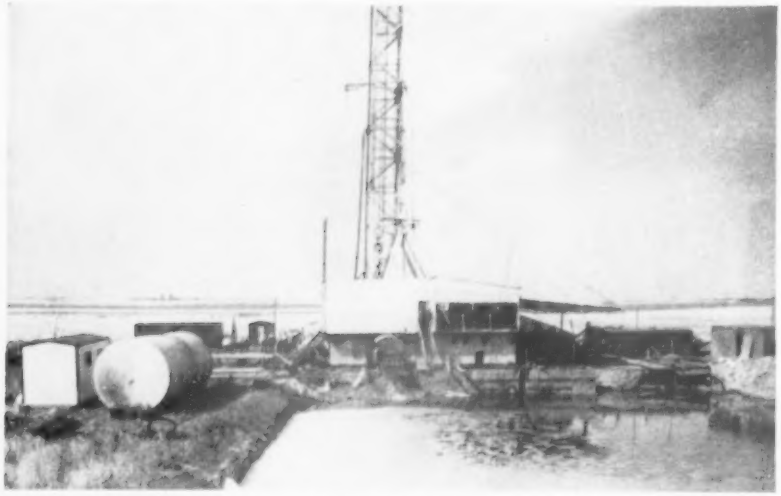
PIPE LINES.—Welding completed on big Trans Mountain crude project except for 5 miles at the top of Coquihalla Pass and 22 miles at the Burnaby, B. C., end of the line. . . . All construction work and testing set for completion before October 1, oil to move shortly thereafter, H. H. Anderson tells Journal. . . . ¶ODM flashes green light for construction of Yellowstone Pipe Line Co.'s 540-mile, 10-in. products carrier from Billings, Mont., to Spokane, Wash., on recommendation of PAD. . . . ¶Lakehead Pipe Line to pull second 20,000-ft. line across the Mackinac Straits this week on its 644-mile, 30-in. crude line from Superior, Wis., to Sarnia, Ont. . . .

TRENDS.—Withdrawals from gasoline storage from the end of last March to the end of August amounted to less than 20,000,000 bbl., the smallest stock decrease since 1948. . . . More than 50 per cent of 5-month stock drop came in June when buyers rushed purchases to beat the price increase. . . . Gasoline stocks at the end of March were almost 6,000,000 bbl. greater than a year earlier. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,504,150 bbl. daily for week ended September 5, down 76,300 bbl. daily. . . . ¶Total well completions for the week decreased 79 wells to 931. . . . ¶Wildcat completions totaled 198 compared with 215 for preceding week and 212 for same week last year. . . . ¶Rotary rigs operating in the United States increased 22 rigs for week ended September 7 to 2,632. . . .

INTERNATIONAL.—Anglo-Iranian erecting process units at site of 100,000-bbl. Aden refinery. . . . ¶Italian, Japanese firms finding it difficult to continue Iranian oil imports as governments clamp down. . . . U. S. emergency grant to Iran may pave way for renewal of negotiations on oil question. . . . Some observers predict talks will open within 2 months. . . . ¶Argentina passes new law to encourage foreign investment in oil industry. . . . U. S. investors skeptical because of Argentine's past record. . . . ¶Greece's invitation to private capital to build refinery in the country nets 30 proposals. . . .

REFINING.—Petrochemical industry faces a shift from natural gas to L.P.G. for source material in the years ahead, A.C.S. is told. . . . Reason will be rising cost of gas, making it lose its attraction for petrochem manufacturing, Gulf official says. . . . ¶Standard of Indiana will build world's first fluid cat Hydroformer at Whiting for use in upgrading low-octane naphtha. . . . ¶Hancock Oil to add 4,200-bbl. Thermofor cat cracker and 1,200-bbl. poly unit at Long Beach refinery. . . .



ANOTHER PRODUCER in Beaver Lodge field is completed as development drilling continues at a steady pace. This well, with an estimated potential of 400 bbl. per day, was turned into the line at 73 bbl. per day due to the pipe-line proration caused by lack of markets. This is the Amerada 1 Clarence Iverson "C," the fifth well on wheat farms operated by the owner of the land where the Williston basin discovery well was drilled.

Basin at Awkward Age

Williston's leasing, development, and production outrun markets and pipe lines to throw industry out of balance

Henry D. Ralph

WILLISTON, N. D.—Williston basin oil is suffering growing pains.

Development of some divisions of the industry has moved ahead much faster than others, with the result that the industry is out of balance.

There is more land under lease than can possibly be explored before leases expire, more discovery areas than can be fully developed for several years, and more production than markets can absorb — a condition characteristic of most new oil regions.

As a result, the Williston basin is in a cooling-off period. Some operators are deliberately dragging their feet, waiting for the parade to catch up—a situation which is causing no little grumbling by local citizens who rather expected that the discovery of oil would bring a continuous state of boom.

This is particularly true in the North Dakota portion of the Williston basin where oil was first discovered on the Nesson anticline by the Amerada Petroleum Corp. 1 Clarence Iverson in April 1951.

In the relatively short time since then, progress has been rapid toward development of an integrated oil industry—perhaps more rapid than in any other new area as remote from established oil operations. However, field development in this area has probably been faster than would be justified by purely economic considerations. And this situation may continue for the next several years.

This is most marked in Beaver Lodge and Tioga fields which butt against each other about 50 miles east of this town and which are the only fields in the state undergoing anything like an intensive development program. They could easily produce twice the present output of 14,000 bbl. per day, which is all that can find a market via tank-car haul. The two fields account for 98 per cent of North Dakota's oil production to date.

Output leads demand . . . Refining, pipe-line, and natural-gasoline facilities are now under construction on a scale of around 30,000 to 35,000 bbl. per day. But it will be a year or more before these are all in operation, and by that time the producing capacity of these two fields alone will have increased so that market outlets will still lag behind crude availability.

Nevertheless, field development continues steadily. Amerada Petroleum Corp., which is the principal operator and holds about four-fifths of the acreage, felt impelled to develop Beaver Lodge and Tioga far ahead of the market possibilities for a number of reasons. One, of course, was lease obligations, but also steady drilling proved up reserves justifying construction of marketing facilities by others. The development also induced service and supply companies to set up branches in the Williston area and brought down contract-drilling prices through assurance of continuous work.

As of August 1, 1953, the two fields —which eventually may be considered a single reservoir in the Madison formation — had approximately 28,900 productive acres outlined, and within this area there were 195 producing wells. The drilled-up density now is one well to 161 acres in the Beaver Lodge, or southern end, and one well to 176 acres in the Tioga portion.

This development was not fast enough to please many of the royalty owners, who assumed that the entire area would immediately be drilled up to a density of one well to 40 acres—the spacing pattern originally set by the North Dakota Industrial Commission. Recently, however, a more realistic attitude is prevailing, for royalty owners are discovering that every time a new well is put on production the output of the older wells is reduced. Also, bottom-hole-pressure tests indicate that the reservoir can be drained effectively by wells spaced considerably wider than 40 acres.

Proration . . . The allowable originally set by the commission was 200 bbl. per well per day, but at present severe pipe-line proration is in effect. The only buyer in the area is Stanolind Oil Purchasing Co., which operates a field gathering system and a tank-car loading rack at Tioga for Service Pipe Line Co. This summer it has been selling around 10,000 bbl. per day to the Whiting, Ind., refinery of its parent, Standard Oil Co. (Ind.), and around 4,000 bbl. per day to various small refineries. Because of the costly rail freights, the posted price in the field is $2 per barrel, though the crude, which exceeds 40° gravity, would bring $2.90 per barrel in the Mid-Continent.

Because of the limited outlet, production is strictly prorated by the purchaser, and during August the take was 73 bbl. per well per day. There are 15 or 20 wells which are edge wells or are otherwise deficient and are unable to make 73 bbl. per day. Some of the others could not make 200 bbl. per day, but at least half of the wells could

produce 400 to 600 bbl. per day on a ¼-in. choke. It is believed that the two fields could easily produce 35,000 bbl. per day at present, and development drilling is continuing.

Mandan refinery . . . Service Pipe Line Co. is now laying a 12-in. and 16-in. crude line from Beaver Lodge-Tioga to Mandan, N. D., and is planning an initial throughput of 30,000 bbl. per day. This is the rated capacity of the Mandan refinery now under construction by Standard Oil Co. (Ind.) and which is scheduled to go on stream early next fall. This line's capacity could be increased to 100,000 bbl. per day provided there were a market for that much oil at the Mandan end.

Also by next fall, if not before, Signal Oil & Gas Co. will have completed its gasoline plant at Tioga. It, too, is being designed to handle the gas from 30,000 bbl. per day of crude. The gas-oil ratio in Beaver Lodge-Tioga is about 1,100 cu. ft. per barrel, thus providing 30,000,000 to 45,000,000 cu. ft. per day for processing. About 65 per cent of this volume will be dry residue gas which undoubtedly will be sold to a pipe line but as yet no contract for sale of this residue gas has been negotiated.

The economics of the petroleum industry is thus being brought home to Williston basin residents slowly but effectively. It is now realized that when the pipe line and refinery are completed the output per well will be approximately doubled, the field price of crude will advance to the Mid-Continent gravity scale, and the natural gas and its valuable liquid products can be sold instead of being flared as at present.

Wildcatting active . . . Not only is development drilling continuing in Beaver Lodge-Tioga, but wildcatting is active and other fields await development and pipe-line connections. These two fields are producing exclusively from the Madison formation at about 8,500 ft. The few wells which have gone deeper have found what looks like a highly productive pay in the Upper Silurian at around 11,600 ft., yielding 54° gravity crude with a gas-oil ratio of 8,000 to 1. Eventually this formation may be developed as a condensate field, perhaps with a recycling operation. But this is far down the road.

At present there are 32 seismograph crews operating in North Dakota, and during the first 7 months of 1953 there were 146 wells completed—105 field wells and 41 wildcats. Four fields have been opened on the Nesson anticline directly south of Beaver Lodge. One field has been found off this anticline on a small structure at Fryburg in Billings County, some 50 miles south of the anticline. For the most part these fields still have only one or two wells each and the extent of their producing capacity will not be known for a long time.

In the vast area of the Williston basin in North Dakota east of the Nesson anticline there has been only one discovery area—near Westhope in Bottineau County, close to the Manitoba border. Three fields have been designated in this area, but most of the few wells here are poor producers and are looked upon by many as only semi-commercial.

In the rest of the area east of the Nesson anticline trend there is scattered wildcatting with 10 rigs running currently and 20 to 25 wells completed this summer. The greatest activity is in the "east side" area, where a dozen or 15 wells are being drilled this year on farmouts. These are in an arc extending from Bottineau County southeast into Stutsman County, midway between Bismarck and Fargo. Here the source beds lie only 3,500 to 5,000 ft. below the surface, but they pinch out or wedge out along the edge of the basin. So far there have been few evidences of structures located by seismograph, and it is believed that any oil found will be in stratigraphic traps.

Farmout plans . . . Most leases in this area will expire in 6 to 8 years or less unless drilled and found productive, and this fact is expected to induce a great deal more drilling activity as expiration dates approach.

In anticipation of this, many major companies having extensive holdings in scattered tracts are inviting farmouts to independent producers. A typical arrangement on the east side is to give the independent three 80-acre leases outright plus $10,000 dry-hole money, with the obligation to drill to a specified depth, either basement or 200 ft. into the Lodgepole formation. The operator often gets additional dry-hole contributions from lessees of adjacent tracts.

While this farmout arrangement has induced some drilling, most operators feel that the terms are not sufficiently attractive to result in extensive exploration, particularly since there have been no discoveries on the east side except for the small-producing Bottineau pools. They expect that in a year or two the pressure of approaching lease explorations will force more liberal terms, and that this will bring a great many more independent operators in to the east side of the Williston basin. At present there is so little drilling that drilling contractors have difficulty keeping their rigs and crews employed steadily, and this causes high contract drilling rates through the area.

Few independents are expected to be much interested in western North Dakota east of the Nesson anticline, for here the source beds are very deep and it costs $140,000 or more to drill a well to 8,500 ft. In this area the big lease holders are preparing to offer considerably more liberal farmout terms, but as yet there is very little drilling activity.

A few farmouts have been made in this central area, and several of the larger lease holders are doing seismic work and preparing to drill some test wells. Interest in this area will be greatly stimulated if Stanolind Oil & Gas Co. makes a well of its 1 Woodrow Star-Tribal on the Fort Berthold Indian Reservation in southeastern McKenzie County, which had shows on drill-stem tests below 9,000 ft.

All in all, the picture today is one of slow development in the Williston basin. Most major companies are doing extensive geological and geophysical work to evaluate their holdings, but few of them are yet ready to do much wildcat drilling.

As it was with the Permian basin, which is only about one-fourth the size of the Williston basin, it will take many years to determine the oil potentialities of this area. Development of proven reserves and producing capacity undoubtedly will bring more pipe lines and refinery outlets in due course, and a couple of good wildcat successes east of the Nesson anticline, plus the pressure of expiring leases, could induce a great deal of exploratory drilling within the next 2 or 3 years.

Meanwhile, most operators are still highly optimistic about the future of the Williston basin. It's a blue-chip game because costs are high and payouts long, and they don't expect the basin's potentialities to be realized for another 10 or 15 years.

Yellowstone Approved

WASHINGTON.—Approval of construction of a products pipe line from Billings, Mont., to Spokane, Wash., as contributing to the national defense was given last week by the Office of Defense Mobilization on the recommendation of the Petroleum Administration for Defense.

The 540-mile, 10-in. line, with 2 pumping stations, will be built by Yellowstone Pipe Line Co., Ponca City, Okla. at a cost of $18,700,000. It will have a capacity of 30,000 bbl. of products a day.

In approving the project, the ODM granted accelerated amortization on 25 per cent of the $18,398,300 which the line itself will cost and $265,700 for the right-of-way.

Target for Refiners

New gasoline-additive blend needed to meet preignition enigma created by skyrocketing auto compression ratios

George Weber

NEW YORK.—Refiners have a new target to shoot at—the development of a new gasoline-additive blend which will suppress a combustion phenomenon which has come to be known as preignition.

Automotive lubricating oils also enter this picture, and the preignition qualities of both gasoline and lubes are due for increased attention in the future.

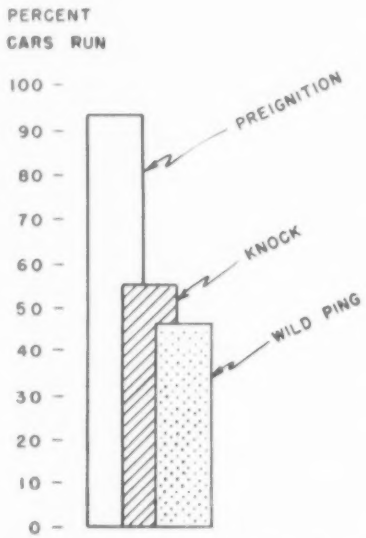
When preignition occurs in modern high-compression-ratio automobile engines, it often sounds like the familiar knock resulting from autoignition. It isn't the same thing. While higher octane fuel can in some cases alleviate this new nuisance it doesn't strike at the heart of the problem. In fact it is strongly suspected that preignition and not the common knock has already forced the octane ratings of current gasoline grades higher than the actual antiknock requirement of some critical cars on the road.

If this is true, it means that a new factor has entered into the octane number-compression ratio relationship. This factor—preignition—is a new breed of cats and calls for a new look at engine design, fuel and lube characteristics, and fuel and lube-additive composition.

While considerable research work has been directed to this problem, the whole picture of how preignition occurs is still somewhat hazy. This type of engine malfunction is elusive, complex, and defiant of simple straightforward evaluation. Certain aspects are becoming clearly defined, and a number of probable avenues for solution have opened. But much work remains before the many interrelating factors can be put together in a clear picture of the how and why of preignition.

Key questions . . . A number of research teams in the petroleum, chemical, and automotive industries are now hard at work attempting to answer three jackpot questions:

1. What are the causes of preignition?
2. What is the relative contribution of each cause to preignition?
3. By what practical measure or combination of measures can preignition most effectively and economically be suppressed?



ROAD TESTS made by Sun Oil Co. on thirty 1952 and 1953 model automobiles with premium commercial fuel showed that some form of preignition occurred in over 90 per cent of the cars. Knock, due to autoignition of the end gas took place in about 55 per cent, while wild ping, a form of preignition, was noted in almost as many. Sun's conclusion: preignition is a serious present problem.

Each of these questions breaks down into many more. Basic research will probably go on for years to come, since it appears that the preignition problem is here to stay. Meanwhile what is being done about it, and who is doing it?

To date a few new measures have been put to commercial application, and they have come from the oil industry. To some oil companies, this new "knock" was Opportunity. A new gasoline additive in one brand is attracting considerable interest from the motoring public. Other companies have been enjoying some marketing successes with improved lubes and unleaded fuels.

This vanguard will, in all probability, be joined by a good many other companies in the near future. Competition at the service-station level will see to that. The next few months will bring to the market, other improved lubes, at least one new gasoline additive and probably some newly blended motor fuels designed to alleviate this emergent problem.

Intensive work in oil and chemical-research laboratories will in time develop further, improved additives for both gasoline and lubricating oils. Some of these will be identified with particular company brands, while others may be offered to the industry at large as components of tetraethyl lead blends or in proprietary additive packages. All in all, it appears that octane, long the primary objective of refiners, is already sharing the spotlight with another quality yardstick measuring ability of a fuel or lube to suppress preignition.

How bad is it? . . . A good many refiners today question whether this new preignition talk is really serious. It is only during the past year that it has gained any substantial attention in the industry as a whole. Is it becoming as prevalent as the common knock?

The answer is a qualified "yes." It is serious, say a great many researchers, and it isn't a new phenomenon. The presence of preignition has long been recognized in engine laboratories. The recent jumping of compression ratios by automobile manufacturers and increasing traffic congestion have brought preignition out of the labs and onto the highways. Obviously, it isn't yet a widespread problem. It occurs mainly in some of the newer cars which represent a small fraction of the total presently on U. S. highways.

Further, the occurrence of preignition is dependent largely on drivers' habits. This makes the problem something of a geographical one. In the densely populated areas, where stop-and-go driving is prevalent, preignition is much more likely to occur than in the areas where so-called "hard" driving actually contributes to better engine performance. This low-duty type of driving sets the scene for preignition, which then occurs usually when engine speed is accelerated. As a result, motorists' complaints traceable to preignition are more likely to arise around large cities, while marketers in less-populated sections have heard relatively little about the problem—yet. The effect of driving habits is illus-

This is the first of two articles on preignition by the Journal's refining editor, George Weber. The second, concerning the relationship of engine deposits and engine design in late model cars to preignition, the tendencies of the various fuels to preignite, and measures for meeting this threat to higher engine efficiency, will be presented next week.

trated by the fact that preignition in a mild form first showed up on the road during the past war. The combined effect of the 30-m.p.h. speed limit and the changed characteristics of wartime gasoline brought about some pinging and engine roughness attributed to high engine deposition and preignition.

Proof on the road . . . A fair appraisal of how present this problem may be, was made recently by Sun Oil Co. It tested twenty-one 1952 cars of nine different makes and nine 1953 cars of six different makes for preignition tendencies. The data it obtained indicate that "preignition is indeed a significant and serious problem." It was present in varying degrees in almost all of the 30 cars tested.

Some of these makes have proved definitely to be preignition-limited. This means that preignition and not common knock was the governing factor in the rising octane requirement of these cars as they received their first few thousand miles of service.

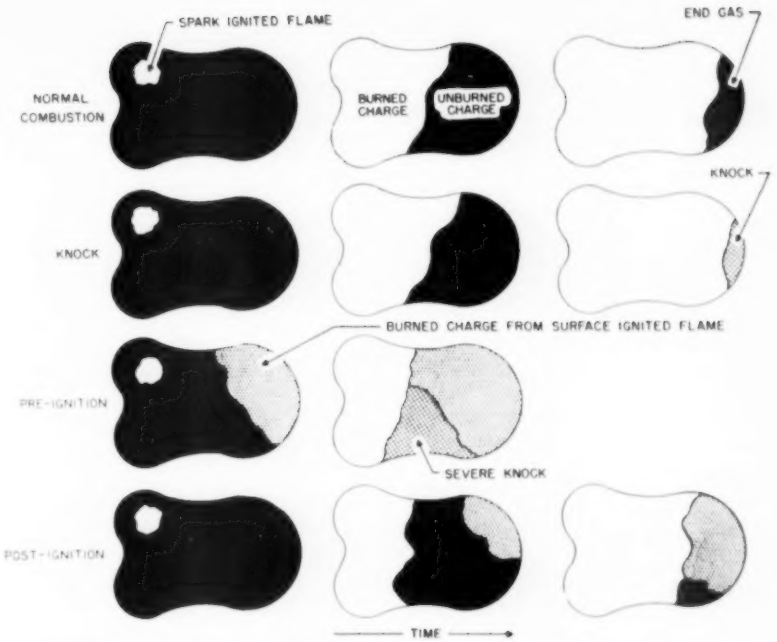
Barring the rather unlikely solution of this problem by a common effort to improve engine design in the near future, it appears that not only is preignition a current problem, but possibly it will get worse before it gets better.

What is preignition? . . . Preignition in its strictest sense is the burning of part or all of the fuel-air mixture in the combustion chamber before the spark occurs. This discussion excludes preignition by engine hot spots resulting from poor engine cooling. While it appears that preignition is the term which will continue in use, better definitions of this abnormal type of combustion would be "deposit ignition" or "surface ignition."

Basically, this phenomenon differs from common knock in the cause of ignition. In autoignition, the end gas most distant from the spark in the combustion chamber is ignited by the pressure and temperature rise brought about mainly by the advancing flame front of the mixture which was spark-ignited. This results in knocking or detonation.

Surface ignition or deposit ignition takes place when deposits in the combustion chamber continue to glow from the heat of the previous cycle, and touch off the fuel mixture before or after occurrence of the spark. Hence, preignition in its strictest sense would relate only to pre-spark ignition, while the broader definitions embrace all phases of this problem.

The causes . . . Two principal factors promote preignition. Engine deposits are obviously a prime factor, since deposit glow sets off the abnormal fuel combustion. But they differ in this



SCHEMATIC DIAGRAMS illustrate the differences between normal combustion, knock, and deposit-induced ignition, which covers both preignition and postignition.

effect. The prevalence of preignition depends on the amount, the location, the particle size, and the composition of these deposits. The latter looms important. Composition governs both the temperature at which deposits begin to glow and the duration of the glow, and hence determines whether a deposit will present a hot surface to cause ignition of the fuel mixture in the first place. Deposit studies have progressed to a point where the blame can be placed on certain types.

Assuming that a deposit continues to glow into the next cycle, the second factor contributing to preignition deals with the tendency of a fuel to be ignited by this glow. Some hydrocarbon components of gasoline readily ignite at the surface temperatures presented by glowing deposits, while others require higher temperatures, and thus tend to resist preignition. This phase of the problem is also under study in many research laboratories.

For practical purposes, this general understanding of what causes preignition is only the start. What remains to be determined is how can deposits be reduced, what can be done to make them resist glowing at existing combustion chamber temperatures, how can they be made to glow for a shorter time, and what can be done with the fuel to make it resist ignition at deposit-glow temperatures.

This statement amounts to an appalling over-simplification of the problem. Before any of these basic questions can even be approached the research team must conduct elaborate tests and must compromise with methods and assumptions which would be considered empirical in a less difficult field of investigation.

What to look for . . . Any discussion of preignition research to date should be prefaced by an explanation of what is being tested and how. No single standard procedure has yet received general acceptance and none is likely for some time to come.

In this respect, evaluation of fuels, lubes, and additives for their preignition tendencies is much more difficult than knock testing. Even with their shortcomings, standard knock-testing methods are simple by comparison.

To begin with, it is difficult to recognize the various types of preignition and to know which evidences are sufficiently important and representative to be measured. Preignition can apparently vary in its effect on engine efficiency and damage from harmless to deadly. It is significant that those research groups which have reported on their work unanimously refrain from claiming to have the "last word."

Sample classification . . . As an example, Du Pont investigators have drawn up an arbitrary classification of the types of surface ignition they have observed. These definitions admittedly overlap to some extent, and the types described may occur singly or in combination. They are:

. . . Silent preignition. It is known that the fuel-air mixture can be surface-ignited in advance of the spark without

any audible effect. When this takes place just before the spark, its effect is often insufficient to cause any knock, ping, or other abnormal noise. This is considered a relatively harmless form although it results in some power loss.

If surface ignition takes place in extreme advance of the spark, most, if not all, of the fuel-air mixture may burn before the piston reaches top dead center. This form of preignition can also be silent, but it can also prove harmful on occasion. The compression of the hot combustion gas by the piston causes abnormally high temperatures which can, on occasion, burn a hole through the piston. This extreme preignition also contributes to abnormal ignition during following cycles.

. . . Rumble. This is a steady preignition accompanied by a low-pitched thudding noise quite different from knock. A knock indicator does not pick up this noise, and there is no evidence of high-frequency gas vibrations on engine pressure-time cards. Engine rumble is evident if you listen for it, although it usually goes undetected in normal road operation or is classified vaguely as "engine roughness." It is definitely related to preignition. The noise originates outside the combustion chamber and is believed to result from vibration of crankshaft bearings.

. . . Wild ping. This results in sharp erratic cracks, primarily during acceleration. This is the type of preignition most generally associated with knock by the motorist. Wild ping and heavy thudding are believed to result when the end gas cannot withstand the high temperature and pressure without detonating before the flame consumes it. Although this detonation is identical to knock, the basic cause is preignition. Wild ping is usually of short duration since the accompanying detonation tends to dislodge and remove the responsible glowing deposits.

. . . After-running. This, due to deposit ignition, can occur in combination with other manifestations of this abnormal operation. It consists of continued ignition of the fuel-air after the spark has been turned off.

. . . Postignition. This arises from the same cause as preignition, except that the charge is ignited by deposits after the spark. Rumble and wild ping are less severe in this type, since lower peak temperatures and pressures are reached and frequently the only manifestation of postignition is silent after-running.

. . . Autoignition. Another manifestation of deposit or surface ignition is the instantaneous explosion of all or part of the fuel-air mixture prior to the spark. This is the most violent form of preignition, which may result in abnormally loud detonation, continuing after the spark ignition has been turned off. It sounds like a loud knocking and in fact is caused, like knock, by high temperature and pressure accentuated by the presence of glowing deposits.

It has been noted that preignition may in many cases be the underlying cause of the common knock. Some mild form of preignition can raise the temperature and pressure in the combustion chamber sufficiently to cause a fuel to autoignite or knock. In such cases, although engines may show none of the outward signs of preignition, they may be truly preignition-limited and not knock-limited. This is apparently occuring with increasing frequency in the newer high-compression-ratio cars.

Detection methods . . . Due to the numerous effects of preignition and to the lack of any fixed pattern for such effects, it is evident that detection and measurement can be most difficult. The sound effects coming from a preigniting engine do not always tell the whole story, although they can be used as handy yardsticks for testing various fuels and additives.

In some tests the wild-ping count serves as an index of preignition. In others, rumble may be amplified and recorded as a qualified indicator. Abnormalities in the pressure-time curve was one of the original methods employed. Flame photographs made through quartz-window heads also have proved useful in studying both autoignition and preignition. These methods are considered useful and valid when employed with due knowledge of their shortcomings.

Ionization method . . . One of the best techniques for isolating and detecting true surface or deposit ignition employs the ionization gap. This requires the installation of an extra, nonfiring spark plug in the head. The conductivity of the spark-plug gap changes when the flame front reaches the gap. Hence, the premature arrival of a flame front at such an ionization gap can be indicated by an oscilloscope as recorded proof of preignition.

This established technique has been applied to single and multicyclinder engines by Sun Oil Co. Other laboratories have been using it for some time in conducting basic preignition studies.

Ethyl Corp. has adapted the standard ionization gap in a device they call the deposit-ignition counter. The gap is positioned so that the normal spark-ignited flame front would reach it at 15° after top dead center. By recording only the passage of flame fronts between 70° before and 10° after top dead center, Ethyl obtains a count of ignitions which are definitely attributable to deposits.

Du Pont investigators have carried the principal further in the use of 17 spark plugs spaced throughout the head of a single-cylinder engine. This enabled them not only to detect ignition ahead of the spark but to trace the origin and spread of the deposit-ignited flame front through the combustion chamber.

Knock-Research Boost

Du Pont, Ethyl scientists unveil new findings on preflame oxidation of hydrocarbons in auto engines at A.C.S. meet

CHICAGO. — The latest results of continuing research on the complex chemical reactions of fuels before they burn and produce power in an automotive engine, were revealed last week in papers sponsored by the petroleum chemical division of the American Chemical Society.

The subject is regarded as of prime importance by refiners since preflame oxidation of hydrocarbons is recognized as a key to their knock behavior in modern engines.

A progress report on analysis of samples withdrawn during knocking and nonknocking operation of a motored engine (no spark) was presented by A. J. Pahnke, P. M. Cohen, and B. M. Sturgis, of the organic-chemicals department of E. I. du Pont de Nemours & Co., Inc. Careful timing of sample withdrawals permitted them to follow the concentrations of intermediate products formed as a function of the peak-cycle temperature.

Knock properties . . . They studied n-heptane, isooctane, diisobutylene and benzene. They found that n-heptane, a bad knocker, formed large amounts of oxidation products, particularly higher aldehydes and ketones, unsaturates, hydrogen peroxide, and formaldehyde, prior to the onset of autoignition. Only limited amounts of these intermediates formed when knock-resistant isooctane was tested.

An inhibiting action appeared to be present when diisobutylene was the fuel, and its oxidation was unlike that exhibited by either n-heptane or isooctane. The investigators were unable to find any of the characteristic intermediate reaction products for benzene, up

to the point of incipient autoignition.

When tetraethyl lead was added to these pure fuels it was found that it inhibited only certain types of preflame oxidation reactions with n-heptane. On the other hand, with isooctane, TEL suppressed the entire oxidation mechanism.

The effect of sulfur on the knocking tendencies of certain unleaded simple hydrocarbons was reported in another paper by W. V. Cohen of du Pont. A third du Pont paper on the combustion of hydrogen as related to knock, concerned the first stage of the study, relating to the parallel behavior of hydrogen and paraffinic fuels.

Cleveland Walcutt, J. M. Mason, and E. B. Rifkin reported on studies conducted by the Ethyl Corp. of the effect of preflame oxidation reactions on engine knock. Their investigation reveals the existence of two classes of chemical reactions which can precede knock in internal-combustion engines. They found one class of precombustion reactions characterized by low-temperature formation of proknock compounds. The second class of reactions, occurring at higher temperatures, is accompanied by radiation and evolution of considerable quantities of heat. This second class of reactions, the authors said, does not increase the knocking tendency of an air-fuel mixture.

Tetraethyl lead, they concluded, does not affect the start of either of these two classes of reactions but does retard the onset of autoignition—presumably by destroying the effectiveness of the proknock materials produced by the first class of reactions.

Lube-oil separation . . . G. R. Irish and A. C. Karbum, of Ethyl, outlined a method termed elution chromatography, used to separate the components of lubricating oil. This technique has been used before in separating the components of lower-boiling petroleum fractions through the gas-oil range.

In this initial application to lube oils, authors get reproducible results with proper control of operating variables. The technique consists of passing the sample through a long vertical tube packed with an adsorbent, such as silica gel or activated alumina. The hydrocarbon class most strongly adsorbed, is halted near the inlet end of the tube, while the less strongly adsorbed classes migrate further along the tube before adsorption. Eventually, a series of bands or zones are formed in the tube, each comprising a separate class of hydrocarbon, such as paraffins, naphthenes, and aromatics, laid down in its order of selective adsorption.

Selected solvents or eluants are then passed through the tube to wash out one class at a time, after which each class is separated from its solvent by distillation. By use of this elution technique, the authors report that a lubricating-oil fraction can be readily separated into its hydrocarbon classes and thus characterized, as paraffinic, naphthenic or aromatic.

Progress in Analysis

New devices to identify chemical, determine its amount, record findings 50 times faster described at A.C.S. meet

CHICAGO. — New, rapid analytical techniques for improved laboratory inspection and process control were outlined here last week in a joint session of the Petroleum and Analytical Chemistry divisions of the A.C.S. Spectro-methods received substantial attention.

New lengths to which automatic analysis can fingerprint a chemical, determine its quantity, and record the findings, were outlined by Lee Cahn, of Beckman Instrumets, Inc. Two new instruments called automatic photoelectric spectrophotometers were discussed. Operating in the ultraviolet, visible, and infrared light ranges, these new devices have speeded up chemical analysis to a rate 50 times faster than conventional manual methods.

One device, an "automatic operator," can be attached to any manual spectrographic instrument. It plots only a few selected points in each wave length, skipping unimportant information, and works seven times as fast as a man employing the spectrograph.

A second instrument, termed a "robot's robot," is a direct transmittance recording spectrophotometer. A beam of light is alternately flashed through an unknown sample and a reference cell 15 times per second. Dividing the sample light intensity by the reference light intensity, it plots the result on a graph with a direct-writing pen. In addition to speeding up analytical work, these instruments open new fields in handling jobs which might never otherwise be attempted because of the labor involved.

Time requirement comparisons were reported on three methods of obtaining mass spectrometric results, by B. F. Dudenbostel, Jr., and William Priestley, Jr., of Esso Laboratories, Standard Oil Development Co. They reported time requirement per sample as 1.65 man-hours for the method employing photographic record plus analog computer, 0.90 man-hours for photographic record plus IBM 602 A punched card calculation, and 0.4 man-hours for Spectro-Sadic digital conversion plus IBM (CPC) calculation.

Catalyst carbon analysis . . . A solution to a bothersome refining problem—how to obtain a faster, more-accurate analysis of carbon in catalyst used in a catalytic cracking unit operating at capacity—was advanced by J. H. Ramser and R. P. Hamlen, of Atlantic Refining Co.

They described a physical test method permitting practically instantaneous estimation of carbon content. The method employs measurement of light reflected from a fluid catalyst sample under standardized conditions.

The reflection method was checked for accuracy over a 5-month period

New Home Planned for Oil Show in West Texas

This huge coliseum, scheduled for construction soon at a cost of $600,000, will house future productions of the Permian Basin Oil Show in Odessa, Tex. The masonry, concrete, and steel building will be 288 ft. long and 208 ft. wide, with a 24 by 64-ft. office and lobby addition to the main building. Two buildings at the old County Park site of the show will be moved to the new site, on Forty-second Street, and improved and beautified.

during which 9 samples were taken every 24 hours. Carbon content by the reflection method was compared with a total of 83 combustion tests made simultaneously. The estimated results followed true carbon content fairly closely.

With few exceptions, it was found that the estimated carbon content showed significant upward or downward changes. With its reliability established, this reflection method offers an improved plant control tool, since instantaneous analysis at low cost will permit carbon control of regenerated catalyst within closer limits.

WEST COAST

Ohio Going Deeper

Record-setting wildcat survives fishing job at nearly 20,600 ft., nears 20,800 ft. in search for Eocene oil

BAKERSFIELD. — Ohio Oil Co.'s deep test in Paloma field near here, was drilling below 20,776 ft. late last week, still in lower Miocene formations, but Ohio was hoping to drill into the Tumey shale, of Oligocene age, at any time.

How much deeper the new depth-record holder will drill has not been announced by Ohio. If the Tumey is not encountered shortly, however, best guesses are that drilling will be halted at around 21,000 ft.

When spudded in October 1951, objective of the deep test was the Point of Rocks sand in the upper Eocene. Based on limited knowledge of these formations in this portion of San Joaquin Valley, it was anticipated they would be encountered at about 21,000 ft. The Miocene, however, has been thicker than was expected.

Generally used correlating point in cross-sections of this portion of the valley is the 16,246-ft. dry hole Standard Oil Co. of California drilled between South Coles Levee and Elk Hills in 1945. This deep test, about 8 miles northwest of the Paloma well, showed the existence of a deep basin between Elk Hills and the Coles Levee-Paloma field trend, as was anticipated.

The Standard wildcat was in a Saucesian shale, lower Miocene, when abandoned, some geologists believed. From Ohio's experience, however, they are wondering if it was not pseudo-Saucesian shale.

The Paloma test at about 19,000 ft. encountered a shale containing bugs which identified it as being of Saucesian age, indicating that Eocene rocks might be found at about 21,000 ft. This call is now believed to be wrong. It is thought that the formation was pseudo or redeposited Saucesian. Thus some geologists are wondering if the Standard test likewise did not encounter this pseudo-Saucesian shale, and if the Eocene in this region is not still deeper than heretofore thought.

Fish recovered . . . Insofar as condition of the hole is concerned, there seems to be little question the Paloma well can drill deeper without danger.

This was illustrated by an incident which occurred shortly after the new depth record was established. The drill string parted about 40 joints off bottom while drilling, necessitating a fishing job. Because of the extreme depth it required about 14 hours before fishing tools could be run to bottom. But despite this delay the fish was engaged and unseated with only a slight pull.

While the Ohio well was having difficulty finding the Eocene, Richfield Oil Corp.'s deep test at North Coles Levee, 7 miles northwest, was thought to be in these formations at 16,149 ft.

On September 9 the well was fishing at that depth but it was reported to have drilled through a thick shale section which was identified as Eocene. The Oceanic sand, of Oligocene age, had not been encountered.

Seal Beach to Appeal

LONG BEACH.—The Seal Beach City Council plans to continue the court fight to prevent Monterey Oil Co. from building a drilling island 1½ miles offshore from that city.

Following the setback handed the city by the Fourth Court of District Appeals, which ruled Monterey could continue with the island's erection, the council voted to appeal the decision to the state Supreme Court.

Seismic Permits Contested

SANTA BARBARA, Calif. — The California Fish and Game Commission has been asked to reconsider its recent actions granting oil companies permission to conduct seismic oil exploration seaward from a quarter mile off the Santa Barbara County coast line.

A formal request for a rehearing was filed by Dist. Atty. Vern B. Thomas, as part of a continuing fight by Santa Barbara city and county officials to prohibit seismic operations within a mile of the coast.

Expectations were that a joint city-county protest would be filed. In addition Joseph J. Callahan, president of the council, was seeking a meeting with Gov. Earl Warren in hopes that the governor would intercede.

Opposition to the issuance of the permits was based primarily on grounds that seismic shooting would damage valuable kelp beds and litter beaches with the seaweed.

Companies holding permits to search for oil in the area include Richfield Oil Corp. was Western Gulf Oil Co. Richfield's permit covers a 34-mile stretch between Point Conception in Santa Barabara County and the city of Santa Barbara. Western Gulf was permitted to operate along the coast between Point Conception and Point Dume in Los Angeles County *(The Oil and Gas Journal, August 10, page 74).*

Gas Injection Approved

LONG BEACH.—The Board of Harbor Commissioners has authorized Richfield Oil Co. to use six harbor oil wells here as gas-injection wells.

The board also approved an expenditure of $42,000 for pipe lines and meters. Installation of the gas-injection system will be handled by a subcontractor, Service Pipeline Construction Co.

Oil Shale Tests Made

WILMINGTON, Calif.—Union Oil Co. is conducting pilot retort tests on Brazilian oil shale to determine if a commercial shale-oil refining plant would be feasible in the Latin American country.

If the proposed 8,000-bbl.-per-day plant is constructed near Sao Paulo, Brazil, it will be the first plant of its kind in the Western Hemisphere.

The tests are being run on 300 tons of Brazilian shale and witnessed by a six-man Brazilian government commission headed by Jose Shore. Dr. Clyde Berg, Union's process-development manager, said preliminary results indicate Union's retort design can achieve economies and operating advantages with the fragile, high water-content Brazilian shale.

Engineers for M. W. Kellogg Co. and Foster Wheeler Co. which may install the unit in Brazil, are also witnessing the tests along with representatives of the U. S. Bureau of Mines synthetic-fuels division.

Petrochem Shift

High production, low price of L.P.G. will lead booming industry to turn away from gas as a raw-material source

George Weber

CHICAGO.—The petrochemical building block of the future will be L.P.G.

This is the studied forecast presented by Eugene E. Ayres, Gulf Research & Development Co., Pittsburgh, at the national meeting of the American Chemical Society on the long-term availability of petroleum and other raw products as sources for organic chemicals.

Speaking during a 2-day symposium on "Petrochemicals in the Postwar Years," Ayres estimated on the basis of present proved reserves of natural gas and crude oil—our potential reserves of L.P.G. from gas processing at 8 billion barrels and from oil refining at 3 billion barrels. This would indicate that sufficient L.P.G. is available to make substantial amounts of chemicals over the next century.

The near-future forecast for L.P.G. is for a large surplus of supply over conventional demand. Because of storage, transportation, and handling costs, L.P.G. must always be sold for less than conventional gasoline, thus subjecting it to a definite, although gradually rising ceiling. Hence, Ayres concludes that L.P.G. will continue to be available in sufficient quantity and at a low enough cost to satisfy all chemical demands for propylene, isobutane, isobutylene, and ethylene until 1970 at the earliest.

Gas use to decline . . . Based on an estimated timetable for domestic gas production (see cut), Ayres predicts that the volume of chemicals produced from dry natural gas will contract rather than expand in the next two decades.

This, he said, will occur not because there will not be enough gas. Substantial gas production will continue long after the peak is reached. Further, several decades after natural gas has ceased to be an important fuel, it will be sufficiently abundant to provide a feed for chemicals manufacture.

However, when production declines, gas likely will not be available at present low prices which make it so attractive to the chemical industry. This, he said, will result in its decline as a chemical source within 20 years.

Assuming an ultimate recoverable reserve of 600 trillion cubic feet, Ayres said there would be sufficient gas at present producing rates to last for 77 years. His curve tracing estimated production was based primarily on three assumptions:

. . . Demand during the next few years will at least equal rate of deliverable supply.

. . . Rate of supply will keep on rising for awhile.

. . . Pipe lines and chemical plants will not be built when it is believed that supply will not equal capacity for more than 10 years.

In this chart the area under the curve from 1952 forward equals the rectangular area representing 600 trillion cubic feet. Hence, shaded areas A plus B must equal C.

Ethane a comer . . . In the long run, he believes that ethane should continue to be cheaper than either propane or butane for ethylene manufacture, and that ethane associated with natural-gasoline manufacture will become an increasingly important petrochemical source.

In view of the probable future trends in refining practices, it appears that ethylene production per barrel of crude may decline, but that improved recovery techniques may well offset that trend. He believes that the ethylene which can be economically recovered directly from refinery gas will not satisfy future demand. The ethylene yield, however, may almost be doubled by conversion of refinery-gas ethane.

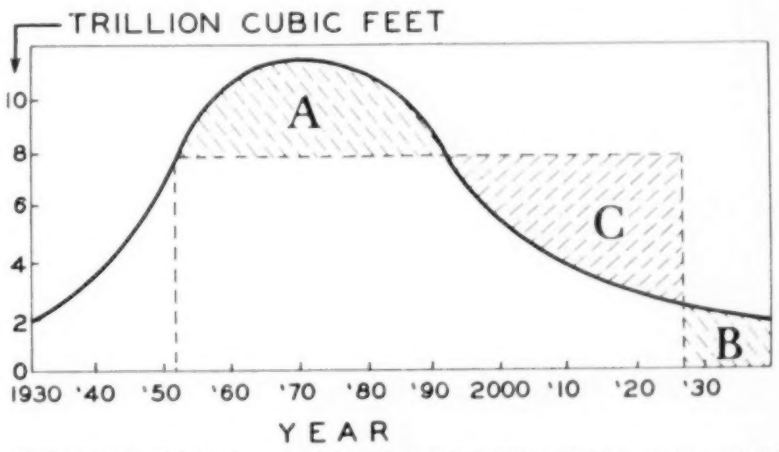
Aromatics to be short lived . . . Ayres sees a fairly short future for the economic production of aromatics from petroleum. Although today, about one-third of domestic aromatic production is from petroleum, he ventures the suggestion that this is true only because expansion of market demand has preceded commercial development of coal hydrogenation for chemicals. Petroleum benzene should have a somewhat shorter life than petroleum toluene because of the relatively better yields.

His views on these probable petroleum sources of chemicals are made with full consideration of the possibilities of other fuels: the Fischer-Tropsch conversion of coal, hydrogenation and low-temperature carbonization, and shale-oil processing.

Fischer-Tropsch conversion of coal should supply substantial amounts of ethylene and other aliphatics, and little motor fuel. Coal hydrogenation looms important in chemical production. Low-temperature coal carbonization should produce abundant gas but does not appear to be as good a source of chemicals as refinery gas. Tar from this process will offer abundant and cheap tar acids. Oil shale does not presently appear to offer important byproducts for current tonnage chemicals, but it may become important in yet undeveloped fields.

Current production . . . R. L. Bateman reviewed postwar trends in petrochemical manufacture and presented an interesting breakdown on 1952 production. The petrochemical industry now supplies close to 25 per cent of all our chemical needs. Thirty-five years ago it supplied none, and by 1965, it promises to account for half the nation's total chemical production.

Petroleum and natural gas entered the chemical picture so successfully be-



PRODUCTION CURVE for estimated ultimate United States natural-gas reserves of 600 trillion cubic feet.

Petrochemicals Production in 1952 in Billions of Pounds

Class—	Petrochemicals	Other	Total	Per cent petrochemicals
Aliphatics	14.3	3.5	17.8	82.0
Aromatics	1.7	2.5	4.2	40.5
Inorganics	5.4	72.6	78.0	7.0
Total	21.4	78.6	*100.4	21.0

*Total includes some products not listed by classifications.

cause they offered unlimited supplies of basics at a relatively stable price, Bateman said. In contrast to metal and agricultural byproducts, they also met more suitably the properties required for many new chemical products.

Bateman's statistics on current production were based mainly on the chemical intermediates. This avoided the common fallacy of duplication when attempts are made to consider basics, intermediates, and finished products. His summary figures are shown in the accompanying table.

It is significant that, although petrochemical intermediates accounted for less than one-quarter of the tonnage of all intermediates, their assigned value of $2.7 billion was half that of the total. Aliphatic intermediates sold for an average of 15 cents per pound, aromatics brought an average of 19 cents, and inorganics 2.5 cents per pound. In assets, Bateman noted that the petrochemical industry had $2.5 billion invested in plants. This represented 52 per cent of all assets in the entire chemical industry—evidence of the high cost of new petrochemical plants and of high gross returns on investment.

In the aliphatics class petroleum-derived intermediates such as ethylene oxide and ethanol, accounted for all but a few chemicals from coal and agricultural sources. Aromatic intermediates from petroleum such as styrene and phenol are newcomers but amounted to over 40 per cent of total chemicals last year.

The inorganic petrochemicals consist of carbon black and intermediates from ammonia and sulfur. The production of sulfur from hydrogen sulfide present in natural and refinery gases last year reached 5 per cent of all sulfur produced in this country. Of the total of 2.05 million tons of ammonia produced last year, 1.2 million tons came from natural gas. Practically all of the 1.8 billion pounds of carbon black was obtained from gas and oil fractions.

Production forecast . . . Bateman sees United States petrochemical production continuing upward to about 31.5 billion pounds in 1955. Of this, aliphatics will continue to lead, with about 19.4 billion pounds, aromatics will increase somewhat to account for about 3 billion pounds, and inorganic intermediates, based mainly on ammonia, will rise to 9.1 billion pounds. Projected 1955 production represents about twice the 1950 production.

From the standpoint of end use of finished petrochemicals, the rubber industry leads in taking 20 per cent of all production, mainly synthetic rubber and carbon black. Automotive and aviation industries consume 17 per cent of the total in the form of gasoline additives, antifreeze compounds, etc. Synthetic fibers take 15 per cent, plastics 14 per cent, agriculture 11 per cent, surface coatings 9 per cent, and explosives 8 per cent.

New processes and products . . . Included among the 21 papers on petrochemicals, were several dealing with new processes and products. In the emergent field of nitrogen and sulfur petrochemicals, R. P. Louthan, A. M. Schnitzer and J. E. Mahan of Phillips Petroleum Co. pointed to a number of new fields.

Synthetic ammonia, first made from natural gas in 1931, now ranks first in tonnage of all petrochemicals. Presently, over half of this important basic is derived from natural gas, and by 1955 the authors estimate that the petrochemical industry's share will amount to more than 75 per cent of total domestic production.

There appears to be some shift away from the steam-methane reforming process to two new processes: the partial oxidation of natural gas with oxygen and the direct use of a hydrogen-rich gas produced by catalytic reforming. Some interest also is evident in the use of low-temperature nitrogen wash for final purification, with effective removal of methane. Synthesis of urea from petrochemical ammonia is coming, the authors believe.

In the field of nitriles, they traced the growth of petrochemical-based hydrogen cyanide from 12 per cent of total production in 1949 to 67 per cent at the end of 1952. Of the prospective growth chemical, acrylonitrile, they noted a second process gaining favor. Synthesis from petrochemical acetylene and hydrogen cyanide may partially replace conversion from ethylene oxide.

Adiponitrile from butadiene, benzonitrile from toluene, and ammonia aliphatic nitriles comprise other petrochemicals with a future. The manufacture of the latter is under study, starting with olefins or acetylene with ammonia.

In the synthetic-fiber field, amides are becoming important. Caprolactum from cyclohexane is a possibility, and solvents for spinning polyacrylonitrile fibers are now produced on a large scale from methanol, ammonia, and carbon monoxide.

Amines, pyridines, and numerous agricultural chemicals containing nitrogen also are gaining. Commercial synthesis of pyridines is a recent development of importance. They find end uses as adhesives, ion-exchange resins, synthetic fibers, rubbers, repellants, and synthetic vitamin products.

Sulfur still gaining . . . Roughly 6 per cent of all sulfur produced in this country now comes from natural and refinery gases, with 1953 production amounting to about 425,000 long tons. Much of this element, recovered from hydrogen sulfide, is converted to acid for internal use.

The alkyl aryl sulfonates have shown a high growth rate, and now contribute to about 65 per cent of the total production of household detergents. Condensation products of mercaptan and ethylene oxide make excellent nonionic detergents. Methyl mercaptan, a well-known byproduct of refining, is a starting point for synthesis of methionine, an important animal-feed supplement.

Even the carbon disulfide field is being invaded by the petrochemical industry, with one company now synthesizing this well-known chemical by vapor-phase catalysis of sulfur and methane or natural gas. Other sulfur compounds of promise in the petrochemical field include the alkanesulfonic acids, dialkyl polysulfides and polysulfones.

The hydroperoxide route . . . Further light on the potentialities of the Hercules-Distillers process for phenol and acetone synthesis, was shed by H. I. Enos, Jr., and J. R. Nixon, Jr., of Hercules Powder Co. They discussed investment and operating costs and yields obtained from the cleavage of cumene hydroperoxide.

Selection of appropriate hydrocarbons for oxidation and splitting can also produce p-cresol, mixed cresols, isopropyl phenols, betanapthol, resorcinol and hydroquinone, the authors said. In addition the hydroperoxides are important catalysts for olefin polymerization to cold rubbers.

A new process for conversion of m- and p-xylenes and mixtures to phthalic esters was reported by Hercules. Commercial demand for this class of petrochemicals was estimated at 200 million pounds in 10 years.

Ethylbenzene's importance was stressed as a starting point for synthetic rubber and synthetic resins. Two manufacturing processes were discussed by F. R. Garner and R. L. Iverson of Koppers Co., Inc.

Also in the styrene field, the diarylethane process for synthesis of methyl and dimethylstyrenes was disclosed by J. K. Dixon and K. W. Saunders of American Cyanamid Co.

Phillips investigators reported on an improved catalyst for butane dehydrogenation. Chromia-alumina catalysts give 15 to 21 per cent higher butene yields than the standard catalysts, they said.

Georgia Tests Planned

ATLANTA.—A series of wildcats will be drilled along the Atlantic Coast of Georgia by a group of operators headed by E. B. Larue, Athens, Tex., according to Gov. Herman Talmadge.

Talmadge said here last week that large-scale exploration is slated for the East Georgia basin. The first well will be drilled on Colonel's Island, in Glynn County. It is slated to go to a depth of 5,500 ft.

Georgia has a standing $100,000 "reward" offered for the discoverer of the first commercial oil production within the state.

Stripper Reserves Set

Compact report shows average stripper well is producing more oil, largely as a result of secondary recovery work

OKLAHOMA CITY.—Primary and secondary-recovery reserves of stripper well fields in this country at the first of the year were estimated at 7,232,000,000 bbl. according to the latest national stripper well survey prepared by the Interstate Oil Compact Commission.

Estimated primary reserves amounted to 4,131,431,000 bbl. at the first of the year. In general, estimated primary reserves from stripper well fields include the oil which it is estimated will be recovered by primary methods of production from fields classified as stripper-well fields. However, in the five states indicated in the table, the primary reserves include any secondary-recovery reserves of projects now in operation.

The estimated probable secondary-recovery reserves are the additional reserves which could be recovered by the application of fluid injection methods.

Total primary and secondary recovery reserves on January 1, 1941 were estimated at 4,086,000,000 bbl. compared with the estimate for the first of this year of over 7,200,000,000 bbl.

Production from stripper wells in 1941 averaged 1.94 bbl. per well per day. The average for 1952 had climbed to 3.09 bbl. per well per day.

Total production from stripper wells in 1952 amounted to 374,175,498 bbl. or 16.3 per cent of total crude production for the year.

The increases in production from stripper well fields in many states have come from the operation of secondary-recovery water floods. It is estimated that about 80,225,000 bbl. of oil per year is attributable to water-flood operations in stripper well fields. Secondary-recovery gas drives account for about 11,860,000 bbl. per year. Thus, secondary-recovery added about 92,085,000 bbl. to the country's crude output last year or enough to meet total domestic demand for about 13 days.

NATIONAL STRIPPER WELL SURVEY AS OF JANUARY 1, 1953

State—	No. of wells	Production 1952 (bbl.)	Average per well daily production 1952 (bbl.)	Productive acres	1952 abandonments	Thousands of barrels: Accumulative production, stripper fields to 1-1-53	Thousands of barrels: Estimated primary reserves, stripper fields*	Thousands of barrels: Estimated probable secondary recovery reserves, stripper fields
Arkansas	2,617	7,911,514	8.28	58,082	49	593,853	115,086	54,121
California	16,155	59,240,000	10.05	113,445	106	3,799,281	629,822	614,000
Colorado	128	684,211	14.64	10,560	8	28,820	35,670	
Illinois	23,209	55,778,000	6.59	417,535	739	1,582,282	*661,793	
Indiana	3,270	11,363,717	9.52	50,760	60	95,517	46,865	25,250
Kansas	20,758	32,563,464	4.30	486,880	1,171	1,298,777	*283,530	65,600
Kentucky	15,732	4,000,000	0.70	72,000	300	45,000	51,000	50,000
Louisiana	4,824	9,066,099	5.15	76,115	369	497,098	72,726	44,600
Michigan	3,890	12,770,513	9.00	124,710	196	348,664	61,098	25,000
Mississippi	180	595,093	9.06	7,200	25	25,566	2,345	
Missouri	76	24,000	0.87	7,000		860	200	
Montana	2,972	3,665,237	3.38	63,610	36	145,552	27,521	13,250
Nebraska	64	260,000	11.12	3,180	15	7,194	2,080	
New Mexico	2,653	3,995,899	4.13	105,720	18	146,495	31,795	67,000
New York	29,474	4,240,000	0.39	88,710	550	181,086	46,947	50,012
Ohio	16,226	3,349,750	0.57	151,000	1,844	627,904	27,370	9,000
Oklahoma	47,724	60,359,467	3.47	745,788	1,103	4,295,818	*710,113	805,720
Pennsylvania	80,621	11,233,530	0.38	625,211	2,592	1,169,380	*121,823	439,117
Tennessee	35	14,800	1.17	185	0	816	150	
Texas, total	45,424	85,085,937	5.13	404,853	4,170	3,136,618	*604,662	665,586
North Texas	18,756	20,044,245	2.93	93,780	662	1,084,743	140,900	281,300
West Central	6,429	4,565,785	1.95	25,716	2,801	171,945	51,432	90,006
Texas, other	20,239	60,475,907	8.19	285,357	707	1,879,930	*412,330	294,280
West Virginia	13,233	2,601,000	0.54	214,044	483	445,303	44,854	56,000
Wyoming	2,793	5,373,267	5.27	46,680	139	478,717	553,981	116,250
Total	332,058	374,175,498	3.09	3,873,268	13,973	18,950,601	4,131,431	3,100,506

*Primary reserve estimates include secondary recovery reserves of projects now in operation.

Drilling Costs Still Going Up

DALLAS.—The only thing that hasn't increased for the drilling contractor is his revenue per foot drilled, according to the American Association of Oilwell Drilling Contractors.

Labor costs are up 98 per cent and equipment 88 per cent over the level of 1941, while the revenue per foot drilled is now only 1 per cent higher, according to figures developed by the association.

The only thing keeping the contractor going, the study indicates, is the fact that penetration rates have gained steadily during the 12-year period since 1941 and are now 42 per cent higher.

Revenue per foot is lower now than at any time since 1941, the figures show. The peak in per foot earnings was reached in 1945, when contract prices reached a point 15 per cent higher than in 1941.

The accompanying table is a breakdown of the economic factors by years.

COMPARISON OF DRILLING COSTS, REVENUE, AND RATE OF PENETRATION

(Figures represent per cent of 1941)

	1941	1945	1947	1948	1949	1950	1951	1952	1953
Labor costs	100	140	150	170	180	190	196	197	198
Equipment costs	100	110	132	145	160	175	180	183	188
Miscellaneous costs	100	120	160	165	170	175	181	185	188
Total rotary drilling costs	100	122	145	160	170	180	186	189	192
Revenue per foot drilled	100	115	110	105	101	100	103	103	101
Rate of penetration	100	105	115	120	125	135	140	141	142

Florida Test Abandoned

ST. PETERSBURG, Fla.—Sinclair Oil & Gas Co. plans to plug and abandon its deep wildcat in Key Largo.

The well, 1 H. R. Williams, has been drilled to a total depth of 11,962 ft. The decision to abandon the test was made after four drill-stem tests in the Sunnyland zone, from 9,555-10,035 ft. All recovered salt water.

The deepest well ever drilled in Florida was Gulf Oil Corp.'s 1 State of Florida, in Monroe County, which was abandoned in a gray limestone of the lower Cretaceous age at 15,455 ft.

Darst Creek Wells Sold

CORPUS CHRISTI.—The Edgar Davis Estate's interest in United North & South Development Co., of Luling, Tex., has been purchased by La Gloria Corp. here for $2,200,000. The estate held 71 per cent of the stock of United North & South.

Principal holdings are 48 wells in Darst Creek field of Guadalupe County, Texas.

The development company was organized after the late Edgar Davis sold his United North & South Oil Co. to Magnolia Petroleum Co. for $17,000,000 in 1926. The original firm discovered and developed old Luling field.

Ibex Buys Gas Properties

BRECKENRIDGE, Tex.—Ibex Co. here has purchased Consolidated Gasoline Co., Eastland, Tex., and Cisco Gas Corp., Cisco, Tex.

Included in the sale was Consolidated's natural-gasoline plant southwest of Eastland, Cisco's gas distribution system which serves 1,400 customers in Cisco, and 15 oil and gas-producing leases. Terms of the purchase were not announced.

Process Facilities Sold

HOUSTON.—Properties valued at $800,000 have been acquired by Refinery & Gasoline Plant Equipment, Inc., of Houston, from Col. D. Harold Byrd, Dallas independent oil operator.

Included are a refinery and cycling plant near Palestine, Tex. Under arrangement, the acquiring company will act as a holding company until the final disposition of the facilities is made.

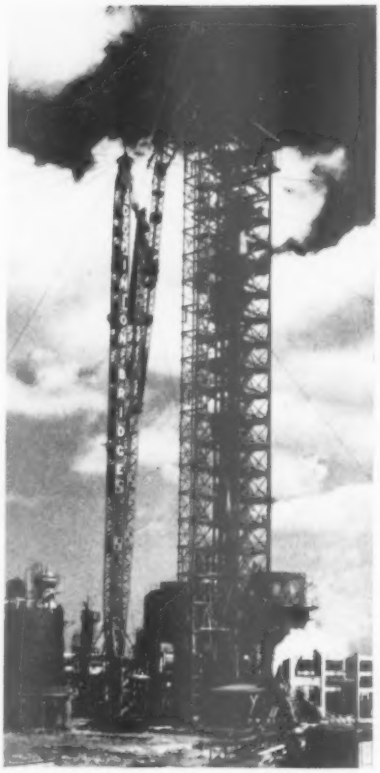
The plants, constructed in 1943, are on a 31-acre tract near Palestine. The refinery has a crude unit with capacity of 2,500 bbl. per day, a 1,770-bbl. per day thermal cracking unit, a 750-bbl. per day reforming unit, and a new skid-mounted 100-bbl. per day polymerization unit. The cycling plant has a capacity of 50,000,000 cu. ft. per day.

Wood County Flood Sought

AUSTIN.—Operators of the Merigale-Paul Flood Unit No. 2, Merigale-Paul field, Wood County, have asked the Texas Railroad Commission for permission to water flood the Sub-Clarksville sand of the unit at 4,800 ft.

T. E. Baird, Jr., spokesman for B. F. Phillips, Jr., said 18 wells in the 156 productive acres involved produce an average of 5 bbl. daily. He estimated the water injection would make recovery of an additional 500,000 bbl. possible.

In addition to Phillips, Bryan Hanks, Bright & LaRue, and Phillips Petroleum Co. have interests in the unit.



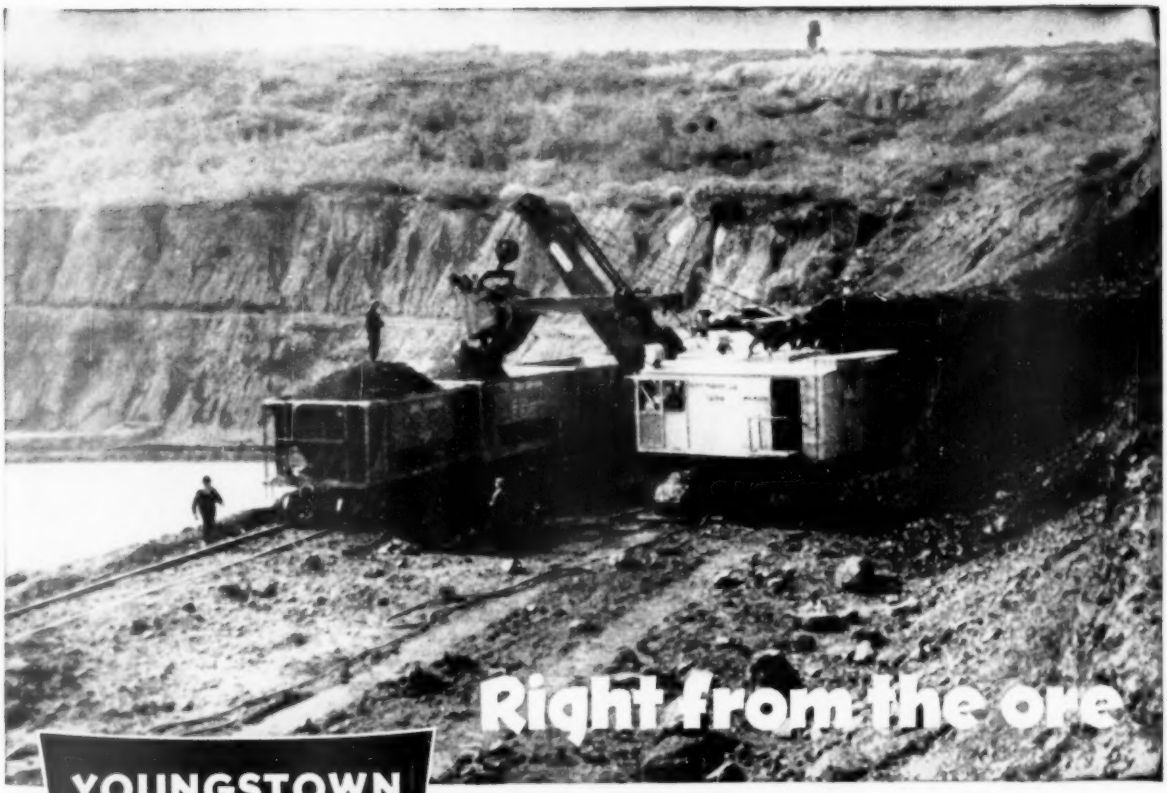
Canada's Biggest Derrick

Sun Oil Co. is making progress on construction of its new refinery at Sarnia, as shown by this photo of erection work on process units. The 150-ton erection derrick, the largest of its type to be designed and built in Canada, Catalytic Construction Co. of Canada, Ltd., is principal contractor for the refinery. The derrick has a 160-ft. boom and a 180-ft. mast.

Industry Briefs

NEW YORK.—Shell Oil Co. and Continental Oil Co. announced September 10 completion of arrangements under which TCP, Shell's new gasoline additive, will be used in Conoco's Supergasoline. J. G. Jordan, Shell vice president, said the arrangement will make TCP available coast to coast.

HEMPSTEAD, Tex.—A bloc'k of approximately 3,500 acres, south of Waller, Tex., has been taken for Glenn McCarthy, Houston oil operator, by W. C. Dunlap, Jr. The leases are in Polly Perry League, U&ICRR Survey, Abstracts 29, 30, 31, and 37.



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Wire Rope at Work—Near Hazleton, Pa., lie rich seams of anthracite coal which in places are not far below the surface of the ground. The dragline excavator shown here, owned by A. E. Dick Contracting Co., is getting at the coal by stripping off overburden—the cover of earth that is about 120 ft in thickness at this particular point.

Using a 22-yd bucket, the excavator can scoop up thousands of cubic yards of dirt and rock per day. It works 'round the clock, with only minor interruptions. This mechanical mastodon is fitted throughout with Bethlehem Wire Rope, including twin draglines and hoist lines, visible in the picture as they handle the bucket. A typical assignment, the kind of rough, tough job entrusted to Bethlehem rope in every type of industry, wherever there is heavy lifting or hauling to be done.

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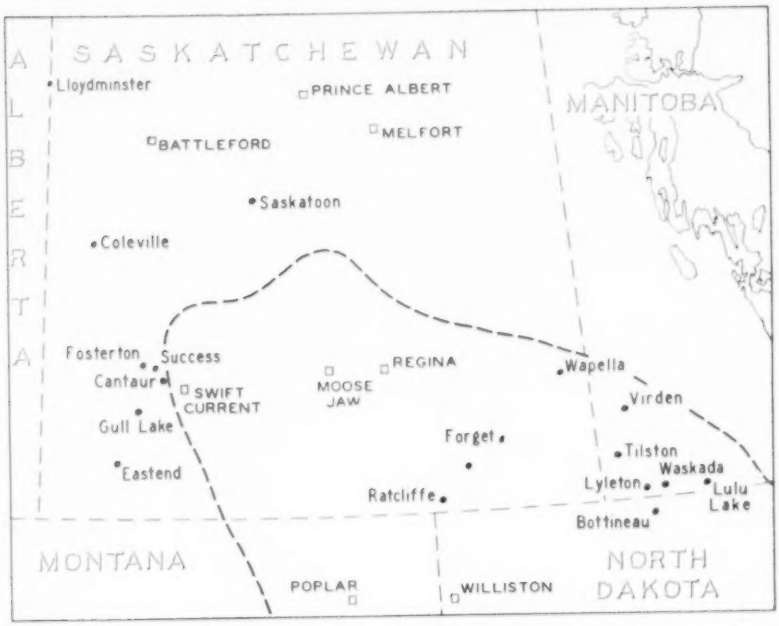


POINTS IN SASKATCHEWAN of current interest to oil men. The dotted line is the approximate edge of the Williston basin.

Lease Bids Are Clues

Bids offered in Saskatchewan's first sale of oil leases will indicate operators' estimate of province's potential

Henry D. Ralph

REGINA, Sask.—The first sale of oil leases on crown lands in Saskatchewan, due to be announced shortly, will give the oil industry and the general public its first estimate of the evaluation that operators put on the future of oil development in this province.

Bids on 34 quarter-section tracts checkerboarded in four proven fields were received September 8 by the Petroleum and Natural Gas Branch of the Department of Mineral Resources, and awards are expected to be made about 10 days later.

One of these fields is Coleville, discovered in 1951, the first oil development in Saskatchewan except for the old Lloydminster field which straddles the Alberta border to the north. The lease sale includes only rights to the oil-producing horizon, which yields crude of 16° gravity, and carries no rights to the shallower Viking gas pay which is now being developed as a source of natural gas for the city of Saskatoon, and which may be unitized.

The other tracts are in the Fosterton, Success, and Cantaur fields which lie close together northeast of the town of Swift Current in the southwestern corner of the province. These fields produce crude of 20° to 23° gravity. Socony-Vacuum Oil Co., Inc., has announced plans to construct a pipe line from this area to Regina refineries, a distance of about 175 miles.

During the past 2 years of oil development in southern Saskatchewan the operators have been working under exploratory permits or reservations which require them to checkerboard discovery areas for producing leases and return the remaining acreage to the provincial government for sale to the highest bidders. The number of companies bidding in the September 8 auction in these four fields and the prices paid by the successful bidders will be a clue to what operators think of the worth of these areas which so far have produced relatively small quantities of low-gravity crude.

Williston basin . . . The Fosterton area lies at what is generally considered to be the northwest rim of the Williston basin. Fosterton, the first discovery in this area, now has 25 wells capable of production. Success has 37 wells and Cantaur has 18. Other producible fields in the Fosterton area are North Premier, Midway, Gull Lake, and Java, with from 1 to 12 wells each. Farther south, near the Montana border, is Eastend field, discovered a year ago and which now has 5 producible wells. In this general area production is found at around 4,000 to 5,000 ft., but all its wells must be pumped and few can produce as much as 100 bbl. per day.

To the east, along the southern border and in the southeast corner of the province, there have been a number of discoveries near the northeastern rim of the Williston basin, principally near Wapella, Ratcliffe, Forget, and Midale. To date these are not of great commercial importance, but they are considered significant as indicating that oil can be found all around the edge of the Williston basin where the source beds lie at much shallower depths than on the deeply buried Nesson and Glendive anticlines in the center.

This region is similar to the corner of the Williston basin lying in southwestern Manitoba, where oil has been found at Virden, Tilston, Lula Lake, and Waskada, just north of production in Bottineau County, North Dakota.

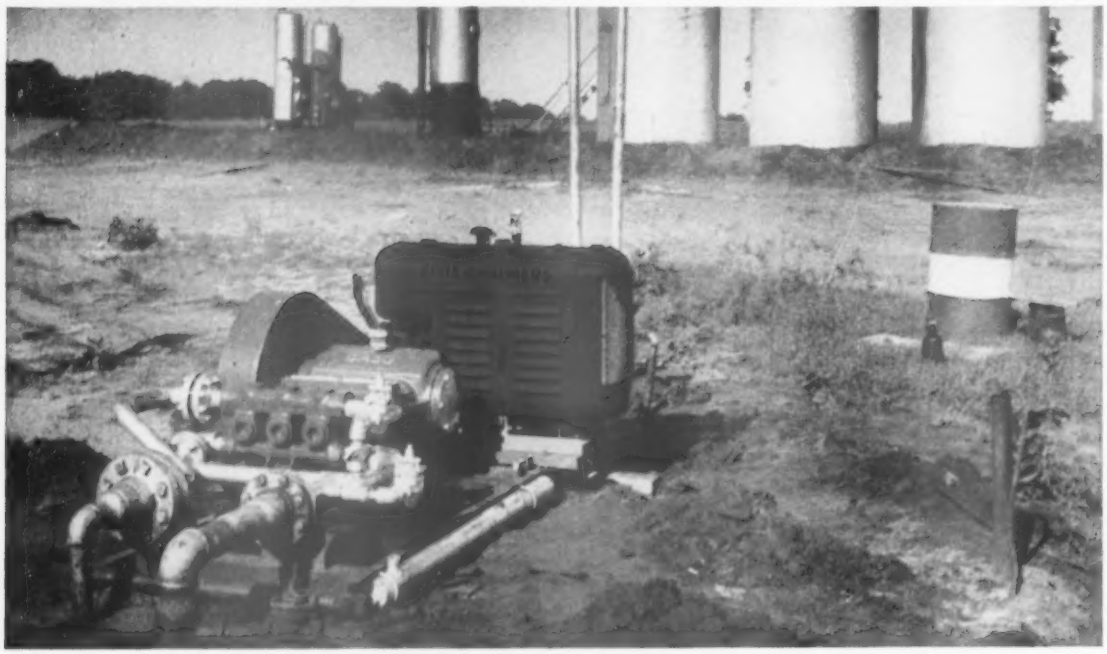
Active exploration . . . At present there is close to 30,000,000 acres under more or less active exploration in Saskatchewan, with an average of 30 seismograph crews per month in the field. There are 38 rigs running in the province, and operators' schedules call for drilling between 900 and 1,000 wells between March 1953 and March 1954, about evenly divided between wildcat and field wells. Exclusive of the old Lloydminster field, there are 347 wells in the province rated as successful or potentially productive, and the wildcat success ratio has been about 1 out of 10. It is estimated that close to $17,000,000 has been spent in all phases of the petroleum industry in Saskatchewan since the first of this year.

The Saskatchewan marketing area is now entirely self-sufficient in refining capacity. The three refineries near Regina and one at Moose Jaw now have a capacity to handle about 70,000 bbl. of crude per day, and expansion projects now under way will raise this to close to 90,000 bbl. per day.

Approximately 65,000 bbl. per day of crude comes from Alberta via the Interprovincial pipe line, and about 5,000 to 6,000 bbl. per day of Saskatchewan crude is being refined in the province, chiefly on an experimental basis to determine its refining characteristics.

Crude production in the province

On the Line . . for Years to Come



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varies greatly with the season and the ability of producers to reach a market. Cumulative production of crude oil in Saskatchewan during the first 6 months of 1953 totaled 1,197,000 bbl.

Most of the exploratory work has been in the southern part of Saskatchewan, but provincial officials anticipate that interest will return to an area of some 20,000,000 acres in the north-central region. In this region the pre-Cambrian is not so deep, but there is up to 5,000 ft. of sedimentary section. A couple of years ago operators gave this region a light going over, but have been concentrating in the Williston basin part of the province since discoveries were made there. There are possibilities of a reef trend in a northwest-southeast belt through Prince Albert and Melfort, but to date the few wildcats in north-central Saskatchewan have found only salt water in the reefs.

Regulation . . . Saskatchewan is now just perfecting the machinery to administer its new conservation act and regulations. The act was passed in the spring of 1952 after prolonged conferences with industry, and regulations were promulgated February 14, 1953. A three-member Oil and Gas Conservation Board has been created under the provincial Department of Mineral Resources. The board has authority to regulate drilling, spacing, plugging and completion practices, salt-water disposal, and similar operations. It may set allowables and maximum dates of production, and, with the approval of the cabinet, may require pool-wide unit operation.

The board has just opened a core laboratory in Regina where operators may inspect the cores of all wells drilled in the province. It has also established a statistical service and has begun the publication of a monthly report on drilling, production, and other petroleum activities in Saskatchewan.

Petrochem Plant on Stream

PETROLIA, Ont.—S. Nord Chemical Co. has begun producing benzene, toulene, and xylene on a limited scale at the former Canadian Oil Companies, Ltd., refinery here.

The remodeled plant, which utilizes heavy platformate received by tank cars from district refineries, made its first test run late in August. Production is expected to be stepped up soon.

Ioco Refinery Opening Set

VANCOUVER.—The newly expanded Ioco, B. C., refinery of Imperial Oil, Ltd., will be officially opened September 16.

In a $13,000,000 construction program, the refinery was expanded from 12,000 to 22,500 bbl. daily. New facilities include a 7,600-bbl. fluid catalytic cracking unit.

Crude Line Nearly Finished

EDMONTON, Alta.—Oil will begin moving through the Trans Mountain crude-oil line within a few days after October 1, H. H. Anderson, Trans Mountain vice president and general manager, announced last week.

Early last week welding had been completed on all but 5 miles at the top of Coquihalla Pass and 22 miles at the Burnaby, B. C., end of the line.

Pressure testing of the line with water had been completed on the first 575 miles, except for two sections totalling 47 miles. Anderson said all construction work and testing is expected to be completed before October 1, with first deliveries of oil possible shortly thereafter.

The 711-mile, 24-in. line will connect Alberta crude-oil production with refineries in the Puget Sound area.

NATIONAL AFFAIRS

New Goals for Oil

Program would prepare industry to meet first months of all-out war, give it time then for essential expansion

Bertram F. Linz

WASHINGTON.—New long-range expansion goals to enable the oil industry to meet the initial impact of war have been developed by the Petroleum Administration for Defense and are expected to be given prompt approval by the Office of Defense Mobilization.

Here is what PAD sees as necessary to meet the requirements of the first months of all-out war:

. . . Domestic refining capacity: Should be increased to 8,500,000 bbl. daily by January 1, 1955, and (tentatively) to 8,750,000 bbl. daily by January 1, 1956, and 9,000,000 bbl. daily by January 1, 1957.

. . . Natural-gas liquids: Construction of 120,000 bbl. per day of production and processing facilities in each of the years 1954 and 1955 to attain a goal of 1,280,000 bbl. daily by December 31, 1955.

. . . Oil pipe lines: 1954 and 1955 expansion goals for domestic construction should be set at 7,250 equivalent miles of pipe based on 16-in. diameter ⅜-in. wall pipe weighing 138 tons of steel per mile, requiring 1,000,000 tons of steel per year.

No goal is set for foreign oil-pipeline construction over the next 2 years in the belief that the foreign industry will continue to construct lines as required by the world-wide demand situation. Materials are not expected to be limited and no special financial incentives are needed.

. . . Storage: Goals for the construction of domestic storage capacity should be 63,750,000 bbl. for each of the years 1954 and 1955, giving a total of 1,337,500,000 bbl. of capacity by December 31, 1955.

No goal is provided for tankage abroad, on the same grounds as given for pipe-line construction.

. . . Lubricating oils: Because the supply situation has eased considerably, it now appears that the goal for construction of 28,000 bbl. per day of lubricating-oil refining capacity will not be realized by the target date of January 1, 1955. It is recommended that the program be extended through 1955. This would give a total capacity of 194,000 bbl. daily by January 1, 1956.

The goal for provision of an additional 15,000,000 lb. per month detergent additive capacity, incorporated in the lubricating-oil program, will be achieved, and it is recommended that no extension or expansion of this goal be established.

. . . Gas pipe lines: Construction (equivalent miles) of 8,650 miles of large and 17,700 miles of small pipe line in each of the years 1954 and 1955.

. . . Tetraethyl lead: The goal established in 1952 for construction of capacity to reach an annual capacity of 570,000,000 lb. by January 1, 1954, will be met and the supply situation for TEL is expected to be such as to make the setting of new goals for 1954 and 1955 unwarranted.

. . . Alkylate: The alkylate program established in April 1953 calls for the construction of 30,000 bbl. daily of additional facilities by December 31, 1954, but the long-term trend toward decreasing use of aviation gasoline in favor of jet fuel indicates that this goal should not be extended beyond

present plans. So far, approximately 10,000 bbl. of the projected expansion has been secured.

Achievement of such a program would allow time for any expansion in productive capacity required by a prolonged period of hostilities Deputy Administrator Joseph A. LaFortune explained laying the plan before the ODM.

LaFortune added it would be impractical to develop reserve capacity in basic facilities such as producing and refining because the date of any possible start of hostilities and the duration of a war cannot be predicted. Also it would be beyond the financial resources of the industry to build and maintain a reserve capacity sufficient to cover the petroleum requirements of the United States and friendly foreign nations over a prolonged period of hostilities.

"Maintenance of a large volume of excess capacity would, over a period of time, result in an obsolete and inefficient plant," LaFortune pointed out.

The present problem is solely one of preparing for war, the ODM was told. Present plans of the industry indicate that the estimated requirements of the United States and our allies under conditions of partial mobilization will be met "with a reasonable margin of safety."

LaFortune conceded that some difficulty is being experienced in inducing the industry to undertake a program for all-out war, although he expressed confidence that the industry can and will carry out the program which is being laid down.

The oil industry is unique, he said, in that over-all requirements under war conditions are not likely to be materially different from those in peacetime, and increased military requirements, with the exception of aviation gasoline, can just about be balanced by savings which can be obtained through conservation and rationing of the civilian economy.

No goal for crude . . . PAD's new expansion program makes no provision for crude production because "present estimates of productive capacity are substantially in excess of current requirements for partial mobilization and would permit meeting the initial impact of wartime requirements.

"It appears that the materials supply situation will permit industry to drill sufficient wells to keep pace with growing demands and to continue to maintain reserve productive capacity roughly in line with the current reserve estimated by the National Petroleum Council for the United States at 955,-

WATCHING WASHINGTON

Bertram F. Linz

Antitrust Suit Ready

The Justice Department has disclosed that it has ready for filing an antitrust suit which "involves a large area, a large industry, and demands large relief," and observers in Washington are speculating that it may be aimed at the oil industry.

The suit is one of 139 cases now being reviewed in the department under a new policy which calls for formal action only when the good that may be accomplished outweighs the harm that might be done, it was revealed by Asst. Atty. Gen. Stanley N. Barnes, head of the antitrust division.

Barnes told the American Bar Association last month in "appropriate" cases, before any suit is filed counsel for the proposed defendants will be asked to confer with the department looking toward an out-of-court settlement.

Suits now ready for filing will be the test of the pre-suit conference idea. If the meetings produce any results, Barnes intimated, they will be used as normal procedure.

Shelf Problems Complex

Interior Department regulations for oil and gas leases in the Continental Shelf probably will not be written until well toward the end of the year.

When they are completed, however, it is expected the industry will be given an opportunity to review and comment upon them before they are formally issued.

Regulations for leases in navigable waters are more difficult to write than the rules for upland operations. The department's legal experts are running into a number of difficult problems because of the complexity of the laws that will apply.

Under the act providing for federal administration of the Continental Shelf beyond state borders, a number of federal statutes will apply to oil and gas operations, while at the same time the conservation laws of the adjacent states will be recognized.

The regulations now being written will not have to provide for application of all these laws, of course, but it probably will be necessary to write in appropriate requirements for the lighting of platforms, for instance, to safeguard navigation; for the laying of pipe lines and other matters which do not enter into operations on shore.

When the department has the answers to all these problems it will probably give the industry the privilege of reviewing the regulations and make suggestions for changes which may be desirable from the practical operating standpoint.

Budget Picture Brighter

Many businessmen have recently expressed fears that the end of fighting in Korea will touch off a business recession but government financial experts see little probability of such a development during the current fiscal year.

Continuance of a high level of business, maximum employment and high individual income are forecast in the latest review of the 1954 federal budget, which now places the actual deficit for the year at $3.8 billion, a reduction of $6.1 billion from the original estimate last January.

Budget Bureau studies of the industrial situation, including that of the oil and gas industry, leads to an estimate that $22,540,000,000 will be collected in corporation taxes during the year which ends next June 30. While $760,000,000 less than estimated last January, due in part to elimination of the excess profits tax at the end of 1953, this will be $945,000,000 more than was actually collected in the 1953 fiscal year.

Excise tax collections, including the 4 levies on oil, are now placed at $10,005,000,000, an increase of $136,000,000 over the January estimate and $27,000,000 more than was collected last year, although some of the emergency increases are due to expire.

An important figure is the estimate that individual income tax collections for the current fiscal year will amount to $34,870,000,000, an increase of $536,000,000 over the January forecast and $1,500,000,000 more than actually secured in the year ended last June 30.

Significant, too, is the estimate of employment tax collections of $5,-450,000,000, an increase of $201,-000,000 over the January expectation and $452,000,000 more than was collected last year.

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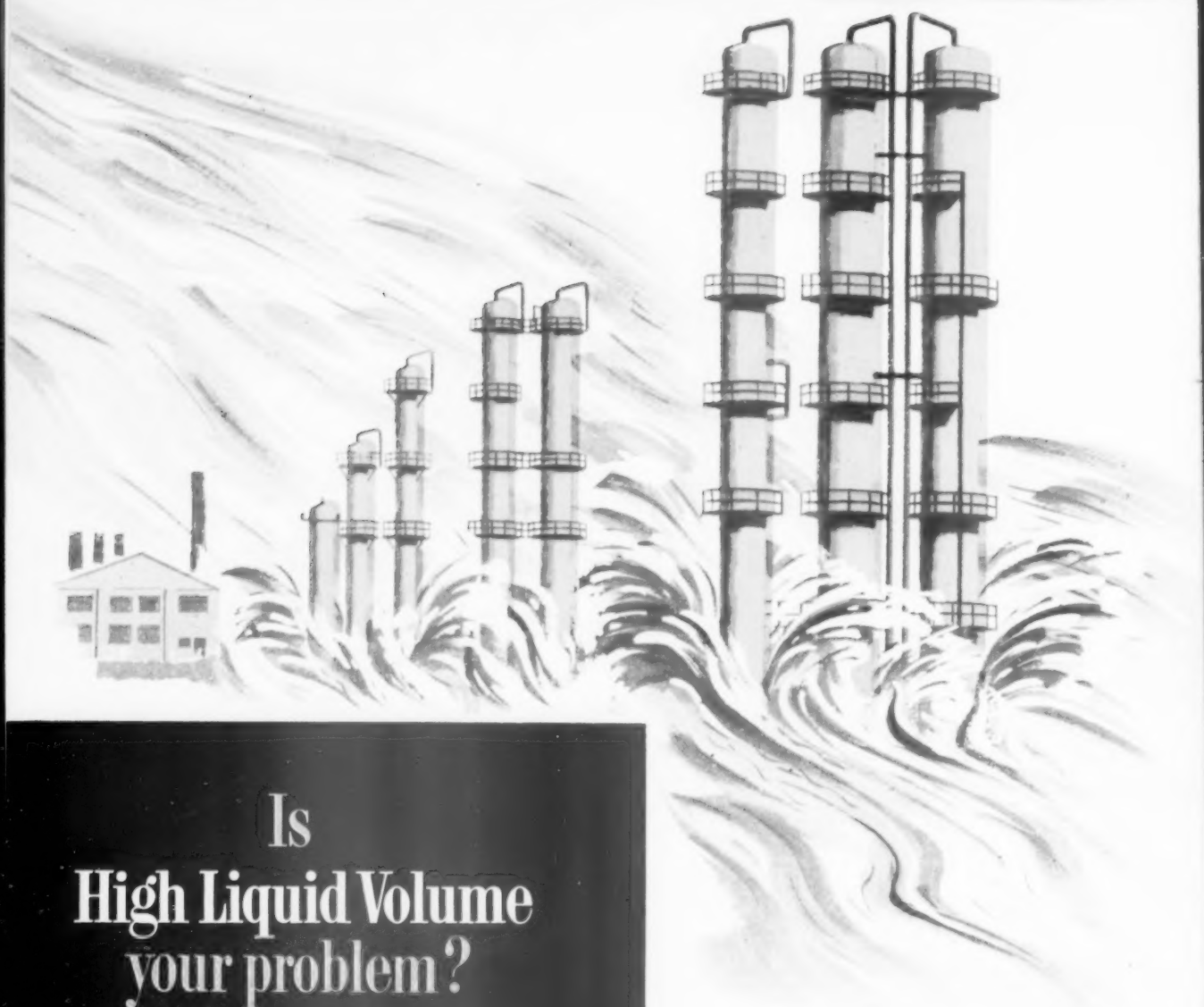

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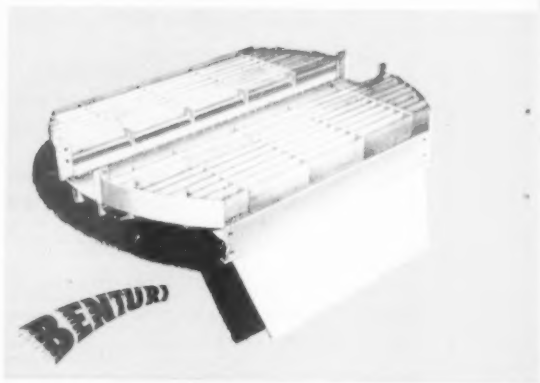

REPRESENTATIVES

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000 bbl. daily in January 1953)," LaFortune said. "This, we believe, industry will do. We propose, however, to make periodic reviews of the productive capacity of the free world.

"Should the reserve margin reach a point which, in our opinion, jeopardizes the mobilization effort or the ability of the United States and other friendly nations to meet the initial petroleum demands of war, recommendations for the establishment of new goals as well as the providing of incentives to assure their attainment will be forthcoming."

State Suit Attacked

Arkansas has no basis for tidelands suit, court told

WASHINGTON. — The Department of Justice, which for years fought vigorously on behalf of federal ownership of the so-called tidelands, is now fighting equally vigorously on behalf of state ownership.

The department last week asked the Federal District Court here to dismiss a suit filed by the State of Arkansas to invalidate the recent quitclaiming by Congress of the oil-bearing submerged lands off California, Texas, and Louisiana which the Supreme Court had held were subject to the "paramount rights" of the federal Government.

In a motion filed September 7, the department contended that the suit, although directed toward Secretary of the Interior Douglas McKay, Secretary of the Navy Robert B. Anderson, and Mrs. Ivy Baker Priest, Treasurer of the United States, it actually was a suit against the federal Government which, the court was told, cannot be sued without its prior consent.

The state's suit, the first of several which it had been announced would be brought, was filed July 8. It asked the court to declare the tidelands quitclaim act unconstitutional and to prohibit the three officials named from returning to the states more than $50,000,000 of royalty and other payments under state leases which had been held in escrow.

Trust involved? . . . The state contended that the submerged oil lands were held by the federal Government in trust for all the states and their citizens and the quitclaim act would deprive the people of Arkansas of their share of the revenues therefrom.

In its brief, the department denied that federal lands are held as a "trust" and cannot be given to the states, pointing out that under other laws Congress has granted Arkansas alone more than 11,000,000 acres of federal lands.

Denying that any trust for the benefit of the states exists with respect to the offshore lands, the department asserted that "since there is no suggestion of any claim of right by the state other than the trust there is nothing before the court upon which it can act" and asked dismissal of the suit.

The state has until September 17 to reply to the department's motion, after which a date will be set for the hearing of argument.

Six Mobile Cranes Nurse Tank Into Position

When this 20,000-bbl. crude-storage tank was moved from its place of construction to its permanent position at Shell Oil Co.'s central treating plant in Ventura Avenue field, extremely close coordination was required of the six mobile cranes used for the move. The tank being moved, and the one behind it, were erected about 1,000 ft. from their eventual resting place. This was done to eliminate the danger of welding too close to the wash tanks and other storage facilities. Moving the 105-ton tanks to the permanent site took nearly 2 days.

Export Rules to Be Eased

WASHINGTON.—Export controls on oil-country tubular goods, large-diameter line pipe and structural steel will be eased October 1 by the Office of International Trade.

In view of the continued improvement in the domestic supply situation all quantity limitations on these items will be removed after this month and "open-end" quotas will be established commencing with the fourth quarter.

As a result, the previously established time schedules for applications for authority to export will be revoked and such applications now may be filed at any time for shipment after October 1.

Oil Expenditures Estimated

WASHINGTON. — The petroleum industry expects to expend $1,500,000,000 in new plant and equipment during the last half of this year, or slightly more than 10 per cent of such expenditures by all American business, it was announced last week by the Department of Commerce.

The estimated outlay for new plant and equipment for petroleum and coal products for 1953 as a whole is $2,824,000,000, compared with $2,596,000,000 last year and $2,102,000,000 in 1951.

The department figured that the petroleum industry spent around $552,000,000 in this way in the first quarter and $724,000,000 in the second quarter. The expenditure for the current quarter is estimated at $785,000,000 and it is expected that $763,000,000 will be spent in the fourth quarter.

Navy Fuel Movement Down

WASHINGTON.—The end of fighting in Korea appears to have lessened the oil-transportation requirements of the Armed Forces.

The Navy announced last week that it has chartered only 10 clean tankers for single voyages beginning in October. For September, the Military Sea Transportation Service chartered 22 clean and 15 dirty tankers.

The October charters were made at rates ranging from 15 to 16 per cent below the basic Maritime Commission rates applicable in the area of the voyage. The September charters ranged from Maritime Commission rates to 20 per cent below.

OVER-ALL VIEW of the refinery site. Foundations for the No. 1 topping unit are in the foreground.

MIDDLE EAST

Plant Units Going Up

Work pushed on SO_2 plant, topping unit, and underground piping at site of A.I.O.C.'s huge new refinery at Aden

Dahl M. Duff

WORK on Anglo-Iranian Oil Co., Ltd.'s, Aden refinery, largest refining project now under construction, has progressed from the site and camp-preparation stage to actual erection of plant units.

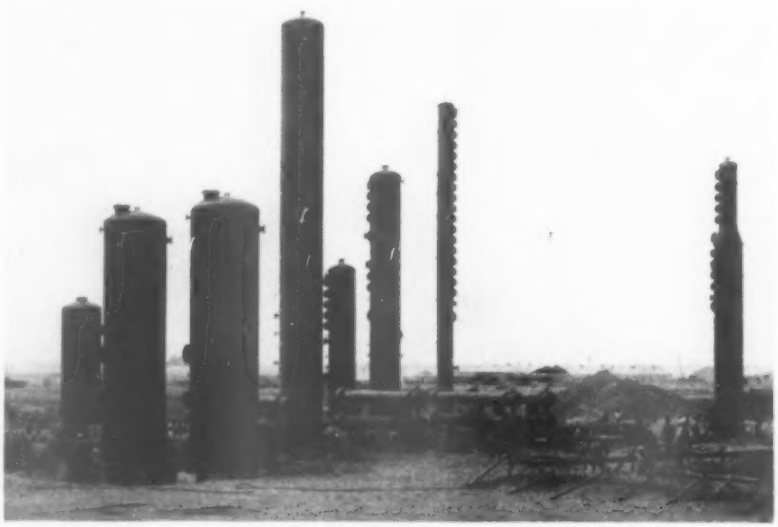
The Aden refinery, which will have a capacity of about 100,000 bbl. daily, is the largest of seven new refineries projected or being built in the Indian Ocean area.

Near Fremantle in western Australia, Anglo-Iranian has a 60,000-bbl. daily refinery also in the early construction stage. Three refineries are planned or under way by other companies in India, another is being considered in Pakistan, and South Africa's first refinery is nearing completion.

Work on the Aden refinery started last November, and the pouring of concrete for the major refinery units began in June. Towers and vessels for the sulfur dioxide plant are in position, foundations are being poured for one of the two topping units, and laying of underground piping has started.

Facilities . . . When the refinery is completed at the end of 1954, the facilities will include two topping units each with a capacity of 60,000 bbl. per stream day, a Platformer with a capacity of 12,000 bbl. per stream day, the SO_2 unit with a capacity of 8,800 bbl. per stream day, and an Autofiner capable of handling 3,500 bbl. per stream day.

Contractors for the Aden project are Middle East Bechtel Corp. and George Wimpey & Co. At present, about 10,000 men are employed on the site, including British, Americans, Dutch, Italians, Indians, Pakistanis, Somalis, and local labor. When the peak construction period is reached the end of this year, some 14,000 men will be working on the project, requiring the import of nearly 1,000 tons of food alone each month.



TOWERS of the sulfur dioxide extraction plant, the first unit erected at Aden. The unit will have a capacity of 8,800 bbl. daily for kerosine treating.

PILE DRIVING has been completed for the salt-water pump bay. Six pumps each with a capacity of more than 1,000 gal. per hour will be installed here.

A 700-ft. pontoon bridge has been constructed to cut the road distance between the refinery site on Little Aden peninsula and Aden town from 25 to 20 miles. Government development plans for the area include a permanent road bridge. Road time to Aden will be further reduced by the construction later of a causeway to be built across Aden inner harbor.

Monsoon hampers work . . . Working conditions on the refinery have been made somewhat more difficult recently by the weather. The southwest monsoon broke on Aden in mid-June, a month earlier than usual. July 7, for example, was the hottest, most-humid day in recent history at Aden. The thermometer registered 104° F. with a relative humidity of 73 per cent.

Driving of piles for the first of the tanker jetties is now under way. The jetties will comprise one two-berth finger jetty and two one-berth T-head jetties. A million cubic yards of rock is being placed in position to provide a 4,000-ft. breakwater and a 9,000-ft. bund. Some of the blocks being used for the armoring of the breakwater are being taken from leveling operations near the refinery site. Early in July, a rocky feature known as Wedge Hill was blasted with 34 tons of explosive, and more than 100,000 tons of rock was dislodged.

The Aden project is costing between $112,000,000 and $140,000,000. About 100,000 tons of steel will be used in the refinery, storage tanks, and jetties, and more than 20,000 tons of cement is required to mix the 180,000 cu. yd. of concrete for construction of the refinery and the port. Each of the construction camps is a temporary town with its own facilities. Hospitals, garages, workshops, and storage buildings all were built in the first 4 months. More recently electrical, welding, carpentry, and plumbing shops, power plant, cold-storage plant, laundry, bakery, rock crusher, concrete-batching plant, and administration building were completed.

Oil Flow Drying Up

Italian, Japanese firms find it increasingly difficult to import Iranian oil in face of government disapproval

DESPITE the landing of a third and the loading of a fourth tanker load of Iranian oil by the independent Japanese oil company, Idemitsu Kosan, it now appears that Anglo-Iranian Oil Co., Ltd., has virtually succeeded in stemming the flow of oil from its nationalized properties in Iran.

The third shipment was made in the 18,774-ton Nissyo Maru, the same tanker that brought the two previous cargoes. It carried another 16,000 tons of oil, and it was believed this again consisted of gasoline and light fuel oil, amounting to approximately 120,000 bbl.

Idemitsu's fourth cargo was lifted at Abadan by the 19,000-ton Koei Maru, which the company chartered from Nitto Steamship Co. The cargo was reported in Tokyo to be about 107,000 bbl. of gasoline and 31,500 bbl. of light fuel oil. The tanker is due to arrive in Kawasaki in mid-September.

These shipments brought the number of cargoes exported from Iran in the 2 years since the Iranians took over the operation to 12. Available information indicates they have aggregated about 918,000 bbl., with 560,000 bbl. of products and 358,000 bbl. of crude. When Anglo-Iranian Oil Co., Ltd., was in control of the properties, single-day production was averaging between 600,000 and 700,000 bbl.

Still tied up . . . Other than the four Idemitsu shipments, all the exports by the National Iranian Oil Co. have been to two importing companies in Italy. All the Iranian oil shipped to Italy is still tied up in dock storage, mostly at Venice, with the Italian Government refusing to grant import licenses. No Iranian oil for Italy has been loaded since early July. Anglo-Iranian has further legal action pending against the Italian importers.

The Japanese Government has taken action to end the controversial Iranian oil exports by Japanese citizens through its control of currency allocations. However, Idemitsu is using a previously granted and still-valid dollar allocation which did not restrict the origin of the shipments. This allocation originally amounted to $1,400,000, and in mid-August, before the loading of the Koei Maru, it was reported that the company still had $530,000 left.

Originally it was expected that Idemitsu would exhaust its currency with possibly four tanker loads. Now, however, up to seven loads may be lifted because Iran has cut the price of the oil.

No more dollars . . . Idemitsu's managing director said recently in Tokyo he would not ask for a further currency allocation for Iranian oil in view of his government's position. He said the company has no plans to attempt the trade on a barter basis, a move which the Japanese Government has said it also would oppose. Anglo-Iranian lost a lower court suit to impound the oil but has an appeal pending. A decision is anticipated September 11 from the Tokyo appellate court.

Idemitsu's contract remained unchanged after the political upheaval in Iran which ousted the Mossadegh government. The new Iranian prime minister, however, has said the Mossadegh policy of offering oil at half the world price to Japanese, United States, and certain Italian buyers would not be continued.

Informed oil-company officials said

Announcement!

Continuous Fluid Coking

By arrangement with the Standard Oil Development Company, we are prepared to design and build Continuous Coking Units employing SOD's new fluid-coking process.

The process is especially adaptable for converting heavy fueloil or residuum into more valuable products. Charge-stock may be any reduced-crude or pitches that can be pumped to the unit.

The distillate-products are a high percentage of the throughput. The coke is produced in small particles and is handled as a fluidized solid. Operation is continuous, without periodic decoking.

If you have a problem of improving your refinery balance, we would like to work with you. We are prepared to make economic-studies, estimates, and design-outlines. We are prepared to engineer and build SOD fluid-cokers adapted to your needs.

C F BRAUN & CO

Engineers

ALHAMBRA CALIFORNIA

NEW YORK CHICAGO HOUSTON SAN FRANCISCO

last week previous reports of a shipment of Iranian oil to Chinese Nationalists in Formosa (*The Oil and Gas Journal, August 17, page 91*) were incorrect. The cargo actually was from another producing country in the Middle East.

Talks to Reopen?

U. S. loan to Iran may bring renewed negotiation

ACTION of the United States Government in making an emergency $45,000,000 grant to the new Iranian Government gave rise last week to further predictions that negotiations on the oil question would begin soon.

In Teheran, a special government commission was studying the 1952 Truman-Churchill proposals in an effort to find a basis for reopening negotiations.

An official Iranian source said, however, that the Zahedi government must obtain better terms than those offered in the joint Anglo-American proposals in order to placate Iranian public opinion, still bitterly anti-British because of intensive propaganda during the Mossadegh regime.

This same Iranian official said the Zahedi government wants the United States to submit new proposals for a swift settlement of the dispute. Such a step would be welcome since an early settlement and resumption of operations is imperative in the interests of the country.

Settlement brighter . . . All indications pointed to new and more hopeful steps to end the dispute in the near future. One report said negotiations would begin the second half of September, and another, that talks would be undertaken within 2 months. However, it was felt a resumption of diplomatic relations with Britain would precede or, in any case, be a part of any settlement.

The $45,000,000 grant authorized by President Eisenhower was made after urgent appeals by the new government that the policies of the deposed Mossadegh regime had left it without funds to carry on even normal functions. Another hint of willingness to negotiate an oil settlement came in a statement of thanks by Prime Minister Zahedi when he said that "in the near future . . . we should also be able to begin to make maximum use of our natural resources."

LATIN AMERICA

Peron Woos Capital

New Argentine law designed to attract foreign investment will be eyed warily by U. S. money because of past record

A LAW designed to attract new foreign investment has been passed by the Argentine Congress amid indications the government is interested in outside participation in the oil industry through drilling deals.

The recently passed legislation affects only new investments in industry and mining and guarantees "enterprises of national interest" the right to remit up to 8 per cent of their profits from the second year of operations. It also allows repatriation of capital by annual installments of up to 20 per cent after 10 years.

The legislation is the first important sign of a change in the official Argentine attitude which for years has emphasized and favored national undertakings, among them the government oil fields, Yacimientos Petroliferos Fiscales. President Peron has made statements recently indicating personal dissatisfaction with industries that have been nationalized.

Past record bad . . . The past record, together with remaining legal uncertainties, will cause United States capital to move cautiously before entering Argentine. The law itself is limited in that profits in excess of 8 per cent are not subject to repatriation either as profit or capital. A previous law provides for transfer from Argentina of 5 per cent on investments, but for the past 2 years no firm has obtained permission to remit this amount because of the foreign exchange shortage.

Additional causes for hesitation are found in Argentina's second 5-year plan, under which the government controls domestic and foreign commerce, and in the constitutional provision of 1948 which permits Argentine Government to take over business of a "public service" nature. Three years ago, the Ultramar refinery, jointly owned by Socony-Vacuum Oil Co., Inc., and The Texas Co., closed down and later sold out to the government because of the government's exchange policy and other restrictions.

Drilling contracts . . . Large oil companies operating abroad have shown no interest in drilling-contract arrangements. These have been offered in Mexico without notable success, and several other countries with strong national sentiment have at one time or another made offers of this type to foreign firms.

Officials of some of the larger American oil companies feel that Argentina must go much farther than it has so far in order to attract any substantial amount of foreign oil capital. One executive commented that the 8 per cent remittance allowed on new investments in mining and manufacturing is "nothing for a risk industry."

Insofar as the oil industry is concerned, the Argentine Government is apparently open to making individual deals for individual ventures. If these are to amount to more than straight drilling contracts, Argentina would have to offer reasonable favorable terms and suitable guarantees, even to interest some of the smaller American companies which might be receptive to arrangements of this nature.

Any country seeking to attract foreign oil capital does so in competition with other possible countries of investment throughout the world. While much depends on terms offered geological prospects, and individual company policy, other important considerations are other areas available and the need for developing or diversifying crude supplies at the moment. Working against Argentina's prospects at the present time is the fact that several other countries, particularly Peru and Turkey, have opened up in the last year or two, and many of the larger companies are already heavily committed elsewhere.

It is not expected that even with the most favorable turn of developments would Argentina be willing to offer exploratory concessions as such. Y.P.F.'s strong and near monopoly position has been too firmly established for a complete reversal, even assuming the government desired to do so.

Outlook promising . . . A highly optimistic report on the outlook for American participation in Argentina's oil industry was brought back recently by J. B. O'Connor, executive vice president of the well-known equipment company, Dresser Industries, Inc. After a 5,000-mile tour of Argentina from near the Bolivian border to Tierra Del Fuego, O'Connor said he sincerely felt that Argentina presented an outstanding opportunity for American business

to participate in developing the country's resources by providing capital and technological assistance.

O'Connor, who had two long talks with President Peron, said a key feature of the new 5-year program was to encourage American participation in oil and gas development. The Argentine president discussed detailed plans with O'Connor for bringing in American companies and equipment to explore, drill, lay pipe lines, and conduct other mineral exploration. "In Central Argentina, near the Andes, are promising areas for quick returns to American investors," O'Connor said. "Details of a comprehensive program to be initiated as soon as finalized are now being worked out."

The increasing gap between oil production and consumption in Argentina was brought out during debate on the new foreign investment law in congress. One Peronist deputy said the needs of the oil industry were an important consideration underlying the measure, and that foreign oil participation might take the form of drilling contracts which would "facilitate foreign capital cooperation without affecting basic principles of government policy." Other indications were given that the government is ready to permit small private companies from abroad to participate in the industry.

The two existing producing companies in Argentina are subsidiaries of Royal Dutch-Shell and Standard Oil Co. (N. J.). With a single minor exception, these companies have been given no new acreage in the last 25 years, and thus restricted, their output has dropped from 32 to 20 per cent of the country's total since the end of the war. New acreage has been available only through jointly owned companies with the government, and none has been formed.

Process Unit Shipped

The main tower for the new 20,000-bbl.-daily refinery of Empresa Nacional del Petroleo at Concon, near Valparaiso, Chile, was shipped late in August from New Orleans.

Erection of other equipment is under way at the plant site, and outside facilities are nearing completion.

The refinery, which includes 9,200 bbl. daily thermal cracking, 3,970 bbl. daily thermal reforming, and 4,960 bbl. daily visbreaking, is expected to go on stream about the middle of next year. A crude-oil pipe line about 7 miles long between the port and the refinery has been completed. M. W. Kellogg Co. has the contract for the refinery.

Offers Coming In

Greeks get 30 proposals to build new oil refinery

THE Greek Government has received about 30 proposals in response to its recent invitation for offers for the erection of an oil refinery within the country.

In Athens the Greek Ministry of Coordination said that proposals were received from, among others, Socony-Vacuum Oil Co., Inc., Cities Service Co., Anglo-Iranian Oil Co., Ltd., and the Shell organization.

Terms of invitation . . . The Greek Government's invitation for proposals contemplated licensing construction and operation of a refinery to be owned and controlled by private capital. The government said it was willing to lend up to 50 per cent of the cost if requested. There is no refinery now in Greece.

The refinery asked by the government would be of 30,000-bbl. daily capacity with topping, reforming, and possibly thermal cracking facilities. Applicants were asked to mention if they control a source of crude oil or to outline the manner in which crude would be obtained. The proposal pointed out that Middle East crudes are most suitable.

Applicants were asked to indicate currency in which crude would be paid for, and methods planned for servicing foreign exchange funds used in the project. If not internationally well-known companies, applicants were required to submit evidence of experience and financial standing. November 15 is the deadline for submitting proposals.

Russia Ends Austrian Search

Russian authorities have ordered an end to the Soviet-conducted exploration in search of new oil fields in their zone of occupied Austria, according to reports from Vienna.

Austrian sources said a Soviet economic commission now inspecting all Russian-controlled enterprises in the country made the decision to halt exploratory work. As a result, drilling near Rabensburg on the Austro-Czechoslovakian border and near Muehlberg in lower Austria has been abandoned, and a number of workers dismissed from Soviet-controlled installations at Aderklaa and Neusield an der Zaya.

No reason was given for the reported Russian action, and it was emphasized that the Soviets have no intention of relinquishing control of Austrian oil production in the Zisterdorf area, now estimated to be averaging in excess of 60,000 bbl. daily. The Russians originally seized these fields at the end of the war, contending they were "former German assets" to which they were entitled under agreements at the Potsdam conference.

The Russians have long been charged with "ruinous exploitation methods," producing with little regard to obtaining maximum recovery. As a result, Austrian sources say life of the fields has been reduced to 25 years as a maximum. The substantial quantities of oil taken by the Russians from Austria is believed to be a major reason why they balked all Allied efforts at a treaty which would end the occupation.

New German Units Operating

A new polymerization plant and reforming unit have been completed and placed on stream at the refinery of Gewerkschaft Deurag-Nerag at Misburg, West Germany.

The new units are a part of a modernization and improvement program for the refinery, which has a capacity of about 12,000 bbl. daily with 3,800 bbl. daily in thermal cracking.

The new thermal reformer has a monthly throughput of heavy gasolines of 9,000 tons, half straightrun and half cracked stock.

The polymerization plant has a daily intake of 75 tons of liquid gas, using phosphoric acid catalyst.

Belgian Refinery Dedicated

The new 25,000-bbl. daily refinery of Esso Standard Refinery, S. A., at Antwerp, Belgium, was formally dedicated September 8 at ceremonies attended by Belgian and American officials.

Chester F. Smith, a vice president and director of Standard Oil Co. (N.J.), in the dedication speech expressed confidence that the new plant would be of major benefit to the economy of the entire Benelux area. Guests at the dedication included the Belgian Prime Minister Jean van Houtte and U. S. Ambassador Frederick M. Alger.

The new refinery, which is situated on a 190-acre site on the Scheldt River, went on stream July 1. It processes Saudi Arabian crude into a full line of major products. The plant was built at a cost of $25,000,000 and includes the latest design of fluid catalytic cracking equipment.

Refining Is His Job

Stills have kept Davidson occupied for three decades

MENTION any job in the refining end of the oil industry and George A. Davidson probably has handled it. At 57, the tall, husky Standard Oil Co. of California vice president can look back on 32 years in the business of converting crude into products.

Fresh from the University of California, Davidson went on the payroll at Standard's Richmond refinery in 1921. His degree in chemistry ticketed him for research, but in a matter of months he had shifted to assistant refiner and was busy pushing crude through one of the batteries of stills.

Directly or indirectly, he's been keeping stills going ever since. The complete responsibility for their operation has been his since 1944, the year he was elected an officer of the company.

If heredity or early environment had anything to do with it, George Davidson would probably have never been an oil man. The son of a farmer, he was born in Venango, Neb., a long way from big oil country.

Rural beginning . . . But, as a youth he moved to California with his parents and finished his growing up against a background of some of the most spectacular oil development in history. After a brief stint in a munitions plant during World War I, it was not unnatural that he should tie his fortunes to Standard Oil of California.

Through refiner and foreman of cracking units at Richmond, Davidson rose to cracking superintendent at El Segundo refinery, then went back to Richmond in 1930 to head cracking operations there. In 1933, he was named superintendent at El Segundo, a few months after surviving a flaming airplane smashup in which three others died.

Davidson was recalled to the San Francisco home office to manage the cracking department in 1937. The following year he was named assistant to the manager of manufacturing and, in 1943, assistant manager. He achieved officer status with election to assistant vice president early in 1944, a few months before his ultimate election to vice president.

As head of Standard's refinery operations, Davidson looks after refineries at Richmond, El Segundo, Bakersfield, and Salt Lake City with a combined throughput capacity of 322,000 bbl. a day. He also has the primary responsibility for operation of Standard's far-flung network of pipe lines.

Along with these jobs he inherited the southern California smog headache. Consequently he has been prominently involved in the industry's successful effort to reduce refinery smoke and fumes to the minimum in the Los Angeles area.

Under Davidson's direction, the El Segundo installation has cut discharges of sulfur dioxide from 74 tons a day in 1946 to a present minimum of 3 tons. All hydrogen sulfide is extracted from refinery gases and piped to a chemical company for processing.

During World War II, Davidson served on the Aviation Gasoline Advisory Committee and chairmaned the District Five Aviation Gasoline Subcommittee. More recently he has served as chairman of the Refining Panel of the Military Petroleum Advisory Board.

Fish and electronics . . . With all his time-consuming activities in the line of duty, Davidson still finds time to be an enthusiastic and versatile hobbyist. His first love, ham radio, has occupied most of his spare moments for years and engaged him in conversations with fellow hams throughout the globe.

More recently, his interest in electronics has attracted him to high-fidelity sound systems, including a recent development called bi-naural sound, briefly described as 3-D for the ear. Photography, and a tropical fish collection, round out his leisure-time activities.

Davidson, who lives in San Francisco, is married and the father of a daughter.

David S. Bays, party chief for Geotechnical Corp., has been transferred from Brush to Brighton, Colo.

Karl Thompson, pipe-line superintendent for Placid Oil Co., has been transferred from Gilbertown, Ala., to Springhill, La.

George Edward Hatton, geologist, is now with Nabob Production Co., Amarillo. He had been with Phillips Petroleum Co. at Bartlesville, Okla.

A. R. Kerr, formerly an instructor in petroleum technology at Long Beach City College, has joined **Richard S. Rheem,** independent operator, as district geologist at Bakersfield, Calif.

E. C. Ingbram, general superintendent of New York State Natural Gas Corp., Pittsburgh, has been elected to the firm's board of directors. Ingbram, with the company 21 years, was superintendent of production and storage until being promoted to his present position in January.

Thomas B. Winningham, engineer for Shell Oil Co., has been transferred from Houston to New Orleans.

J. H. THACHER

John H. Thacher, executive assistant to the vice president of California Research Corp., has been elected a vice president of that California Standard affiliate. For the past 3 years Thacher has specialized in problems connected with the Naval Petroleum Reserve at Elk Hills. In his new capacity, he will take over direction of oil-field research, on the October 1 retirement of **E. G. Gaylord,** a Cal Research vice president since 1947.

Ed Poulter, engineer for Texas Pacific Coal & Oil Co., has been transferred from Sundown to Denver City, Tex., as district engineer.

L. O. Wiringa has been promoted to area geologist at Houston by Shell Oil Co. Other changes include: **E. R. Sauermilch,** named division exploration

PERSONALS

manager for the Houston area, a position formerly held by Wiringa; and **E. R. Shorey, Jr.,** senior mechanical engineer at Houston, promoted to area production superintendent at Calgary, Alta.

Dr. D. M. Morrison has been appointed vice president in charge of manufacturing and **R. P. Ritchie** has

D. M. MORRISON

R. P. RITCHIE

been named vice president in charge of transportation and supplies for Shell Oil Co. of Canada, Ltd. Both will continue to have their headquarters in the company's head office in Toronto, Ont. Dr. Morrison formerly was manager of manufacturing and Ritchie formerly was manager of the transportation and supplies department.

Joe Ganner has been named district manager of Arkansas Western Gas Co.'s Clarksville district properties. He has been town plant manager for the company in Clarksville, Ark., since 1945. He previously was with Shamrock Natural Gas Co., Shamrock, Tex., and Tri-Cities Gas Co., Hartshorne, Okla.

Windsor L. Adkison has joined the fuels-branch staff of the U. S. Geological Survey in Tulsa to work on oil and gas investigations. He has been engaged in mapping for the Geological Survey in Kentucky since June 1950.

H. A. Grimes has resigned as a director of Creole Petroleum Corp. and returned to the United States. He first went to Venezuela in 1922 as a petroleum engineer for Standard Oil Co. of Venezuela. He returned to New York in 1943 after serving as manager of the company's eastern Venezuela division. Later he was manager for International Petroleum Co. in Talara, Peru. He rejoined Creole in Venezuela as a technical coordinator in 1950.

James Goodwin has joined Sohio Petroleum Co. as a corrosion engineer at Grayville, Ill. He had been with Texas Eastern Transmission Corp. at Shreveport.

Harold F. Moses has been elected president of Interstate Natural Gas Co., Monroe, La., and general manager of the newly created oil and gas division of Olin Industries, Inc. He has resigned as director and vice president in charge of exploration and research for Carter Oil Co., Tulsa, to accept his new position.

E. A. Weichert, zone superintendent of production for Gulf Oil Corp., at Borger, Tex., has been promoted to assistant division production supervisor at Fort Worth.

Charles Zlomke, assistant production foreman for Cities Service Oil Co., is now at Pauls Valley, Okla., after being transferred from Billings, Mont.

A. E. L. Morris, until recently division geologist for D. D. Feldman Oil & Gas Co. and formerly geologist for General Petroleum Corp. in California and the Rocky Mountain area, has opened offices as a consultant in Los Angeles.

J. F. Dingee, formerly field superintendent for Sunray Oil Corp., at Wewoka, Okla., has been promoted to assistant district superintendent of the company's Kansas production district at Great Bend. **Hobson S. Mann,** senior engineer in Sunray's Gulf Coast Texas production district at Victoria, Tex., succeeds Dingee at Wewoka.

Virgil E. Spradlin has resigned from Skelly Oil Co. in Wichita to become district geologist and Kansas district agent for Mayfair Minerals, Inc. Prior to joining Skelly he was Kansas district geologist for Pure Oil Co.

George C. Roth has been elected vice president in charge of operations for Cities Service Gas Co. He has been with the firm since 1913 and was transferred to Oklahoma City in 1946 as assistant to the operations manager. **Carl J. Taylor,** formerly executive assistant, has been named assistant to the president. **Ray T. Wells,** chief engineer, has been appointed manager of engineering and research. **John L. Gere,** formerly assistant chief engineer, has been promoted to chief engineer. **Russel W. Hofsess,** who has been superintendent of the production department since 1951, has been appointed manager of production and supply.

G. C. ROTH

New Officers To Lead Tulsa Geologists

New officers of the Tulsa Geological Society who will assume their duties at the group's first fall meeting October 2 are: Seated, left to right, H. T. Morley, Stanolind Oil & Gas Co., first vice president; S. Morse Willis, independent geologist, and Erik Waering, Helmerich & Payne, Inc., counselors. Standing, left to right, are S. Grace Hower, American Petroleum Corp., secretary-treasurer; R. E. Megill, Carter Oil Co., outgoing business manager; Paul E. Fitzgerald, Dowell Incorporated, president; Earl T. Peterson, Atlantic Refining Co., business manager, and Philip C. Ingalls, The Oil and Gas Journal, second vice president.

PERSONALS

Bill R. Payne, geologist for Humble Oil & Refining Co., has been transferred from Houston to Midland, Tex.

R. E. Luton has been elected vice president in charge of refining for Ohio Oil Co. Since 1947 he has been serving as manager of the refining division. Prior to that he was general superintendent of refineries for the company.

Laurence A. Green is now a geologist and partner in Green Petroleum Co. at Torrance, Calif. He formerly was an engineer with Southwest Exploration Co. at Huntington Beach, Calif.

R. L. Cole has been named vice president of Anchor Petroleum Co. Cole, who also is manager of the firm's western division at Los Angeles, was with The Texas Co. before joining Anchor 5 years ago.

Cecil W. Smith has been elected president of Montana-Dakota Utilities Co. He has been with the firm 26 years, having served as principal operating officer during the entire period and vice president since 1943. **R. M. Heskett,** former president, has been elected chairman of the board and chief executive officer. Elected vice presidents were: **A. P. Woodson, W. L. Hayes,** and **F. R. Gamble.**

Refinery Committee Meets in Billings

These men took part in the annual meeting of the refinery committee of the Rocky Mountain Oil and Gas Association held recently in Billings, Mont. Left to right, they are: James Scheffield; Barry Nolan; Dr. Donald Bergman; Ralph W. Klee, Carter Oil Co., Billings, retiring chairman; R. E. Howe, Sinclair Refining Co., Sinclair, Wyo., chairman; Charley Allison; Harry Brown; Clyde Cromwell; and Howard Anderson, Glenrock, Wyo. Not pictured is Fred L. Hutton, Socony-Vacuum Oil Co., Inc., Casper, Wyo., who was reelected vice chairman. Casper was selected as the site for next year's meeting of the refinery committee.

DEATHS

John Snyder Orsborn, 61, superintendent for Fullerton Oil Co., Brea, Calif., died recently at Fullerton, Calif.

Paul G. Hardie, 59, Houston, industrial-relations supervisor for Stanolind Oil & Gas Co., died in Houston September 7. He had been with Stanolind since 1919.

Rolly C. Fast, 57, independent oil-equipment broker and former manager of Oil Well Supply Co. in Tampico, Mexico, died recently in Houston.

Felix Henry Eckert, San Antonio, Tex., producer and inventer of oilfield equipment, died recently. He entered the oil business in Spindletop 50 years ago and discovered Eckert field in Bexar County in 1929.

William L. Steed, 75, died of a stroke at his home in San Antonio September 2. He was a native of Virginia but spent his working years in the oil fields of California and Mexico, retiring as general superintendent of Mexican Petroleum Co. at Ebano about 15 years ago.

Charles O. Davis, 65, retired official of Pure Oil Co., died September 6 in Mount Pleasant, Mich.

George S. Hinkle, 53, Houston independent oil operator, died in Houston September 5. He was president of Hinkle Drilling Co.

P. J. Erickson, Jr., 42, vice president and chief engineer of Arkansas Louisiana Gas Co., died September 4 in Shreveport. He was a member of the American Gas Association and the Mid-Continent Oil and Gas Association.

Edwin T. Welch, retired oil producer, died September 2 in Oil City, Pa. He entered the oil business in Illinois and Oklahoma in 1902 and later returned to Oil City. He retired in 1951.

W. Raymond Shively, 45, land man for Union Oil Co. of California, died recently in New Orleans.

Hugh H. Cuthrell, 60-year-old president and board chairman of Brooklyn Union Gas Co., died August 31 in New York. He also was a former president of the American Gas Association.

D. B. Duty, 62, retired oil contractor, died September 8 in Shreveport. He was a native of Mississippi and had been a Shreveport resident 30 years.

Richard Denny Parker, 75, long-time Texas Railroad Commission official, died recently. He became chief engineer for the Railroad Commission in 1908, chief engineer of the new Gas Utilities Division in 1920 and chief of the Oil and Gas Division in 1927.

Edward James Patrick Loftus, 60, research chemist for Union Oil Co., died September 4 in Los Angeles.

Ralph B. Lloyd, 78, a developer of Ventura Avenue oil field, died September 9 at his home in Beverly Hills, Calif.

Considerable reporting and paper work are required of all operators, some of the forms of which are shown here.

Districts and offices of Louisiana's Department of Conservation.

Here's How to Conduct Oil Business in Louisiana

The Pelican State's oil industry operates smoothly under seasoned regulations effectively administered. Authority is concentrated in the conservation commissioner, who is more of a coordinator than a czar.

by Henry D. Ralph
Journal Editorial Staff

LOUISIANA, third largest state in oil production, regulates its oil and gas industry through a one-man, appointive Commissioner of Conservation, the only major oil state with such concentrated authority.

But Commissioner John B. Hussey, like his predecessors, is a moderator and coordinator, not a czar. The state's oil industry operates smoothly under a set of well-tried regulations administered by a corps of petroleum engineers in the headquarters office in its state capital at Baton Rouge and in six district offices.

One-package statute . . . Louisiana has a one-package, omnibus conservation statute, known as Act 157 of 1940. Its purpose is to prevent waste above or belowground, protect correlative rights of surface owners of a common pool, prevent the drilling of unnecessary wells, utilize reservoir energy for oil production, promote safety, and maintain statistical control over all oil and gas operations in the state.

As compared with the regulatory practices of other states, Louisiana's law contains little that is novel or unusual except, perhaps, its completeness

Here are more forms, information from which results in Louisiana having one of the most complete statistical services of any oil state.

and compactness. Its definitions, powers, and procedures are quite similar to those of its neighbor oil states. Considerable reporting and other paper work is required of all operators in the state, but this has not proved unduly burdensome and has resulted in giving Louisiana one of the most complete statistical services of any state in the nation.

Despite its all-embracing title, the Louisiana Department of Conservation is concerned entirely with the oil and gas industry, and its routine operations are conducted under the direction of its chief engineer, Thomas W. Winfiele.

There is no assembled booklet of regulations, and the department's rules for oil and gas operations are contained in various state-wide orders. Those currently effective are Orders 25, 25-A, 29-B, 31, 31-A, and 45-I. Except for a few minor amendments, the texts of these orders have not been changed in the decade or so since they were first promulgated.

Drilling Procedures

Before drilling a well of any kind below the fresh-water level, including a core test, anywhere in Louisiana, a permit must be obtained from the department. The first step is to fill out, in duplicate, a yellow card, Form MD-10-R, "Application for Permit to Drill," giving location of the well, anticipated depth, and similar data. This must be accompanied by a fee of $50, and if actual drilling is not commenced within 90 days, a renewal permit must be obtained at a cost of $5. Also accompanying the application must be two copies of a plat of the well location, preferably drawn to a scale of 500 ft. to the inch. The plat must show all pertinent lease and property lines and locations of other wells, and must be certified by a qualified surveyor or licensed engineer.

Dual completions are treated as two separate wells, and a separate permit must be obtained for each completion.

Applications to drill are filed with the district manager, of one of the six district offices of the department, maintained at Shreveport, Monroe, Lake Charles, Lafayette, Houma, and New Orleans.

The application is then forwarded to the main office in Baton Rouge where approval is granted and a permit serial number is assigned. This serial number, which is not related to the operator's lease and well-number designation, remains with that well permanently and must be used in all subsequent correspondence with the department.

One approved copy of MD-10-R is returned to the district office, which issues the applicant a "Work Permit," Form DM-4-R.

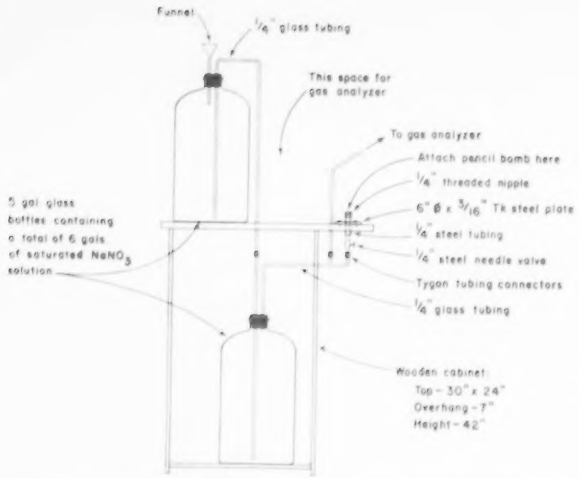
Subsequent operations . . . Additional work permits must be obtained from the district office for any one of 14 possible subsequent operations on a well: plug and abandon, acidize, deepen, perforate, perforate and squeeze, plug back, plug and perforate, plug back and sidetrack, plug and squeeze, pull casing, sidetrack, squeeze, squeeze and perforate, or workover. No one application can cover more than one of these 14 operations. Applications for a work permit is made on a blue card, Form MD-11-R. If speed is necessary, the operator may get oral permission for one of these operations by telephoning the district manager, provided the proper application is filed promptly.

From the moment the operator moves onto location and until the well is formally abandoned, a sign must be displayed showing the operator's name, designation and location of the well and lease, and serial number of the well permit. During drilling an agent of the commission visits the well frequently and submits a weekly scout report to his district office. Each district office gives the Baton Rouge headquarters a consolidated weekly field report on Form DM-7-R showing the condition and depth of all wells drilling or completed.

Also, on every Tuesday, every operator must file with the district office a "Weekly Progress or Drill Report," using an unnumbered mimeographed form, showing any work of any type during which the well is mudded.

A complete driller's log must be filed on completion of every well, using Form 12-M-R OC-6, in triplicate. One copy is retained by the head office, one copy goes to the district office, and the third is sent to the state Geological Survey. Three copies of all

(Continued on page 140)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¼" steel tubing
¼" steel needle valve
Tygon tubing connectors
¼" glass tubing
5 gal glass bottles containing a total of 6 gals of saturated $NaNO_3$ solution
Wooden cabinet
Top – 30" x 24"
Overhang – 7"
Height – 42"

Fig. 1—Apparatus for expanding pencil bomb samples taken on cat poly units.

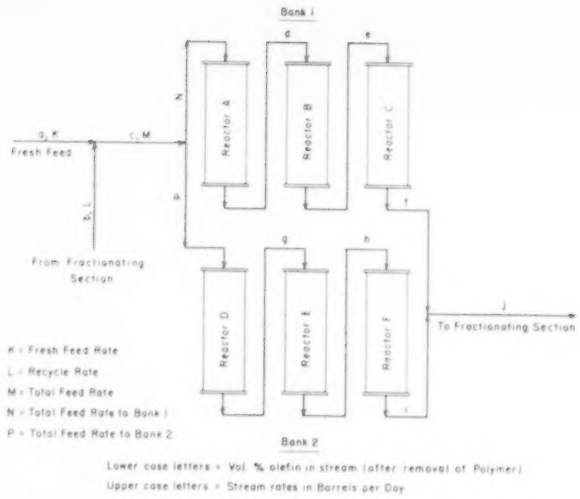

Bank 1
Reactor A
Reactor B
Reactor C
Reactor D
Reactor E
Reactor F
Fresh Feed
From Fractionating Section
To Fractionating Section
Bank 2
K = Fresh Feed Rate
L = Recycle Rate
M = Total Feed Rate
N = Total Feed Rate to Bank 1
P = Total Feed Rate to Bank 2
Lower case letters = Vol. % olefin in stream (after removal of Polymer)
Upper case letters = Stream rates in Barrels per Day

Fig. 2—Typical series—parallel reactor arrangement for catalytic polymerization. Letters indicate nomenclature for equations.

How to Get Optimum Conversion

. . . from your cat poly unit

Control procedure can be applied for a given reactor arrangement to establish day-to-day performance and check on effective catalyst life

by F. P. Lobban*

BECAUSE of its importance in refinery economics and gasoline quality and the fact that the performance of a catalytic polymerization unit varies from one time to another with a change in catalyst activity, extensive studies have been made of control methods and their application to actual operation of units whereby optimum conversion and catalyst life relationships can be maintained.

The olefin contents of the feed, product, and intermediate streams of a catalytic polymerization unit are necessarily the criteria by which the day-to-day performance can be established. They also give information as to the effective utilization or "life" of the catalyst as expressed in gallons of true polymer (C_6+ gasoline) formed per pound of catalyst.

Sampling, analytical procedures for olefins and, in particular, their application to determine conversion and effective catalyst age are important factors in the operation of catalytic polymerization units.

*Chemical engineer, George Armistead & Co., Washington, D. C.

Conversion . . . With daily knowledge of conversion across each reactor, the over-all conversion of fresh feed olefin for the unit, and the effective age of the catalyst in each reactor, the operating supervisor can evaluate the performance of his unit in detail. For example, on a solid phosphoric acid catalyst operation, he can regulate water injection into individual reactors so as to maintain catalyst activities consistent with the age of the catalyst. "Dead" reactors, such as might occur if the catalyst were blown from a tube of a multitube reactor, are readily detected by olefin analyses. Leaks across charge-effluent exchangers can be readily detected by discrepancies in olefin balances.

Catalyst life . . . Possibly the most important application of olefin analyses and the equations to follow is their use in determining economic catalyst life. In a single-reactor operation, it is relatively simple to determine when the cost of a reactor turnaround will be offset by increased polymer production on a fresh catalyst charge. In a multireactor unit, the decision to renew the catalyst in any one given reactor must be based on a careful study of the specific performance data on the reactor concerned and the performance of the unit as a whole.

Catalytic Polymerization

Nonselective catalytic polymerization as an adjunct to catalytic and thermal cracking is an important element in motor-gasoline manufacture. It increases the yield of motor gasoline approximately 3 to 5 per cent on the basis of crude oil run and contributes substantially to octane quality of gasoline. While some of the liquid-recovery functions of catalytic polymerization have been assumed by catalytic alkylation, it still remains a mainstay in most refineries for the conversion of normally gaseous olefinic hydrocarbons to liquid.

In the catalytic polymerization operation, the objective is the conversion of the C_3 and C_4 olefins to polymers boiling in the gasoline range by contact with catalyst in a reactor at elevated temperatures and pressures. The reactor arrangements are of various sorts

from the simplest type of single reactor to the more complex multiple series-parallel arrangements.

For the more complex series-parallel reactor arrangements found in the larger polymerization units, olefin contents of the gaseous portions of the inlet and effluent streams of each reactor are required to be known to determine individual reactor performance. As the reactor effluent streams contain polymer gasoline, it is desirable to have a simple method for separating the unreacted gases from the liquid product so that the olefin content of the former may be determined by an equally simple method usable in the field or by control laboratory technicians.

In securing samples for analysis, there is the necessity for reducing the pressure of the sample from operating levels as high as 1,100 psig. to atmospheric pressure for safe handling in glassware. After such analyses are made, it is further necessary to have established procedures for applying the results to actual practice on the unit.

1—Sampling

"Pencil bombs" are used for sampling all streams for olefin analysis. These bombs are made by welding ¼-in. screwed needle valves to both ends of 6-in. lengths of ¾-in. Schedule 80 seamless-steel tubing. The bombs are rated at 1,400 psig. and should be tested hydraulically before their initial use. In sampling, the bomb is screwed onto a ¼-in. short nipple extending from a ¼-in. needle valve at the end of a conventional ¾-in. sample connection.

Procedure . . . All valves on the bomb and sample connection are opened for a brief purge, after which the outer pencil bomb valve and the remaining valves in turn are closed to confine the sample. The bomb is removed slowly so as to vent the small amount of hydrocarbon trapped in the nipple. An operator can take several of these small samples in a short while thus securing essentially simultaneous data on all streams. As the 1,000-1,100-psig. reactor effluent streams are usually at approximately 400° F. the bombs are warmed in purging and filling which reduces the possibility of overpressure due to thermal expansion if later stored in a warm place. It is, however, good practice to vent a small amount of liquid hydrocarbon from the bombs when they are used to sample the cold charge and final product streams.

Depressuring . . . The apparatus shown in Fig. 1 is used to prepare the contents of a bomb for the subsequent olefin absorption analysis. The lower 5-gal. bottle is filled with saturated sodium nitrate solution, while the upper 5-gal. bottle contains about 1 gal. of the solution. The filled pencil bomb is screwed onto the ¼-in. nipple projecting above the table top. The sample is released slowly into the lower bottle, displacing the confining solution onto the upper bottle. A pencil bomb filled with butane will displace about 3 gal. of solution. The lower bottle is wrapped with wire-mesh screen, and the cabinet is provided with a door which is kept closed for the operator's protection.

2—Running Samples

When the bomb is depressured, the gas sample is taken into an Orsat-type gas analyzer and run for olefin. Meanwhile, the confining solution displaced into the upper 5-gal. bottle exerts a positive pressure on the gas sample in the lower bottle, thus avoiding sample contamination by insuring that any leakage will be out of the system and simplifying the step of drawing a portion of the gas into the gas analyzer. While running the olefin absorption analysis, the operator displaces the unused portion of his sample from the lower bottle by opening both valves on the pencil bomb. The small amount of polymer left in the lower bottle while running a reactor effluent sample is displaced into the empty bomb and discarded.

The average operator can obtain and run six to eight samples in about an hour. The arrangement of the apparatus permits him to attend to other work whenever necessary, as filling or emptying the lower bottle requires no attention beyond opening a single valve. The effect of a small amount of polymer in the reactor effluent samples is considered negligible, as the olefin contents determined by this procedure on various operating units have checked closely with the weighted average olefin contents of the several product streams.

3—Applications

In a typical polymerization unit having, for example, six reactors arranged in two parallel rows, each having three reactors in series, close regulation of operation requires daily spot samples taken of the fresh feed, total reactor feed (fresh feed plus recycle), the effluent streams from each reactor, the combined effluent from the separate rows of reactors, and the individual light product streams, such as off gas, propane and butane. Fig. 2 shows such a reactor arrangement diagrammatically, together with the notation used for stream rates and olefin contents in the following equations:

Per cent conversion . . . Equation 1 is used to determine per cent conversion of the olefins in the inlet gas to each reactor.

$$\text{Per cent conversion} = \frac{100\,(u - v)}{u\,[1.00 - (v/100)]} \qquad (1)$$

where

u = inlet olefin content, volume per cent

v = effluent olefin content, volume per cent

Thus, the conversion (C_B) across Reactor B, using the nomenclature for stream rates and olefin contents shown in Fig. 2, would be:

$$\text{Per cent conversion} = C_B = \frac{100\,(d - e)}{d\,[1.00 - (e/100)]} \qquad (2)$$

Similarly, the conversion (C_1) across a series of reactors, such as Bank 1 in Fig. 2, may be determined from the following equation using:

$$C_1 = \frac{100\,(c - f)}{c\,[1.00 - (f/100)]} \qquad (3)$$

Over-all conversion . . . The basic Formula 4 gives over-all conversion of the total feed of the unit (C_{TF}):

$$C_{TF} = \frac{100\,(c - j)}{c\,[1.00 - (j/100)]} \qquad (4)$$

Over-all conversion on the basis of fresh feed may also be determined from the olefin analyses by the equation:

$$C_{FF} = \frac{100\,[a - j - (L/K) \times (j - b)]}{a\,[1.00 - (j/100)]} \qquad (5)$$

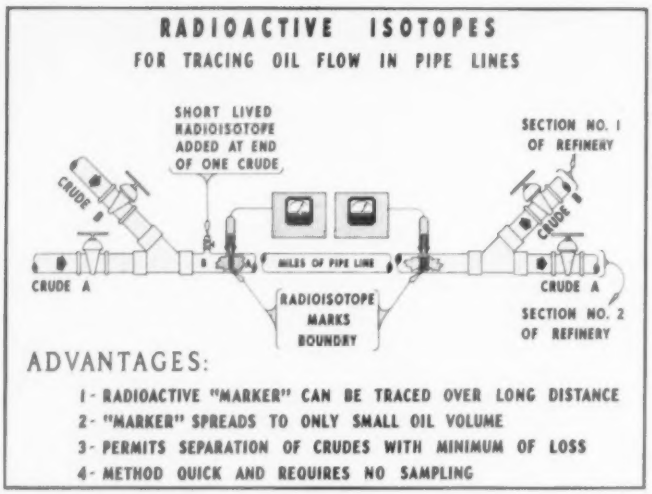
Equation 5 is mathematically correct if L and K are expressed in moles per day of recycle and fresh feed, respectively. However, for practical application, the use of barrels per day as obtained from refinery instruments is adequate. Normal good practice is to check daily average fresh-feed conversion data determined from olefin contents against weekly data accumulated on measured polymer-gasoline yield, metered fresh-feed rates, and the low-

(Continued on page 138)

Radioisotopes

• • • A new and important tool in all phases of industry

by Bertram F. Linz
Washington Editor


RADIOACTIVE ISOTOPES
FOR TRACING OIL FLOW IN PIPE LINES
SHORT LIVED RADIOISOTOPE ADDED AT END OF ONE CRUDE
SECTION NO. 1 OF REFINERY
CRUDE B
CRUDE B
MILES OF PIPE LINE
CRUDE A
CRUDE A
RADIOISOTOPE MARKS BOUNDRY
SECTION NO. 2 OF REFINERY
ADVANTAGES:
1- RADIOACTIVE "MARKER" CAN BE TRACED OVER LONG DISTANCE
2- "MARKER" SPREADS TO ONLY SMALL OIL VOLUME
3- PERMITS SEPARATION OF CRUDES WITH MINIMUM OF LOSS
4- METHOD QUICK AND REQUIRES NO SAMPLING

IN the brief span of 7 years, radioisotopes have achieved the status of an important tool for the petroleum industry, in production, refining, and transportation.

Already they are being used by some companies as a matter of routine in the acid treatment of oil wells, in controlling the flow rate of catalyst, and in product pipe-line operations.

Other uses are being developed and scientists of the Atomic Energy Commission believe they will play a very important part in the oil industry of the future.*

What they are . . . In simplified terms, radioisotopes are chemical products produced in a nuclear reactor—special kinds of atoms that give off radiation, usually beta rays (high-speed electrons) or gamma rays (similar to X-rays) or a combination of both. Sensitive radiation-detection devices make it possible to follow their movement through other materials, even though used only in minute quantities.

In the oil industry, the isotopes are used primarily to show what is happening underground or in inclosed vessels where direct observations are not possible. They can be used to measure circulation in a refinery, as a marker between different products flowing through a pipe line, to trace the movement of oil in an underground reservoir, or far many other purposes.

Isotopes are produced at the U. S. atomic energy plant at Oak Ridge, Tenn., as a byproduct of the work on nuclear fission. While the idea of industrial atomic energy is more dramatic and has received most public attention, in the long run the radioisotopes may be equally important as work horses in scores of industries.

Industrial value . . . In an effort to test the industrial value of isotopes, the AEC has been distributing them since August 1946. So far, over 32,000 shipments have been made to some 1,200 institutions, about 40 per cent of them industrial firms. More than 30 organizations have secured isotopes for use in petroleum research.

The distribution program is under the direction of Edwin A. Wiggin, assistant to the director of the isotopes division and chief of the technical reports branch at Oak Ridge. Organizations securing isotopes submit reports on the results of their use to the AEC to add to the general fund of information which the commission is accumulating.

These reports show that the use of radioactive material is not only making possible the development of more efficient methods of operation in the oil and many other industries but in some cases have contributed to the quick solution of problems which threatened to cost operators large sums of money.

What is probably one of the outstanding examples of the value of isotopes was cited by Wiggin in a recent report.

One of the problems of catalytic cracking, Wiggin pointed out, has been the difficulty of getting measurements on the rate of catalyst circulation. The established method was to measure temperature surges at various points in the reactor, a system requiring a day's work by two men and not always too dependable in its results.

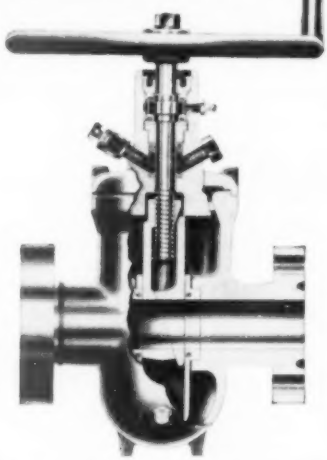
Recently, it was found that the same measurement can be obtained in a direct manner by impregnating a few of the catalyst beads with radioactive zirconium and noting the time interval required for a radioactive bead to pass between a ring of counters fastened at the bottom and top of the seal leg carrying the catalyst between the gas lift and the top of the reactor. By knowing the weight of catalyst in the pipe between the two points it is possible to calculate from the time interval between the two peak radiation readings the catalyst circulation rate in tons per hour.

The value of this method, Wiggin reported, was demonstrated when an emergency developed at one of the Standard Oil Co. of California refineries where it was found that catalyst beads were being consumed at 4 times the normal replacement rate of 2 or 3 tons per day—at $300 per ton. Examination showed that the beads were black with unburned carbon, due to faulty catalyst circulation, and gasoline production was slowed down as a result.

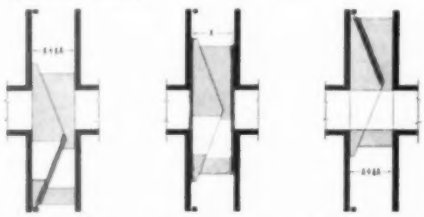
Radioactive beads were put into the plant and the flow rate and circulation studied. It was found that the circulation rate was around 350 tons per hour instead of the design rate of around 300 tons per hour, with the result that not enough time was allowed to clean the beads. The circulation rate was cut back, and within 24 hours the beads were decarbonized, the attrition rate was back to normal, and gasoline production was on schedule.

This one simple test, Wiggin said, eliminated the necessity for a shutdown that would have cost the company $100,000 and the expenditure of thousands of dollars a day for catalyst replacement. A permanent installation has been put in as a routine plant control to prevent recurrence of the problem.

*For a more detailed discussion of the use of isotopes in pipe-line operations see "New Method Developed to Identify Interfaces in Product Pipe Lines," The Oil and Gas Journal, July 7, 1950, page 66; "Radioisotope Tracer Successful in Products Pipe-line Application," Journal, November 10, 1952, page 115; and "How Radioctive Control Is Applied to a Products Pipe Line," Journal, July 6, 1953, page 66.



All W-K-M Valves have a perfectly smooth bore. There are no cavities or projections to cause turbulence or to collect sediment. Gates and seats are protected against cutting or damage of any kind. These advantages are a result of the W-K-M Expanding Gate development which is explained below.



In closed position, the gate (left) and segment (right) seal tightly against both seats.

When opening or closing, the gate and segment are in neutral position permitting free upward or downward movement of the gate assembly.

When open, the gate and segment again seal tightly against both seats and the bore of each lines up perfectly with the bore of the body to provide a smooth, full-round conduit.

You can ***completely*** overhaul a W-K-M Valve right on the tree in one hour! When overhauled, the valve becomes as good as new, ready for many more years of efficient, trouble-free service.

There is no need to go into great detail to point out the advantages and economies of on-the-spot repair or overhaul. Frequently the time and money saved will amount to much more than the cost of the valve.

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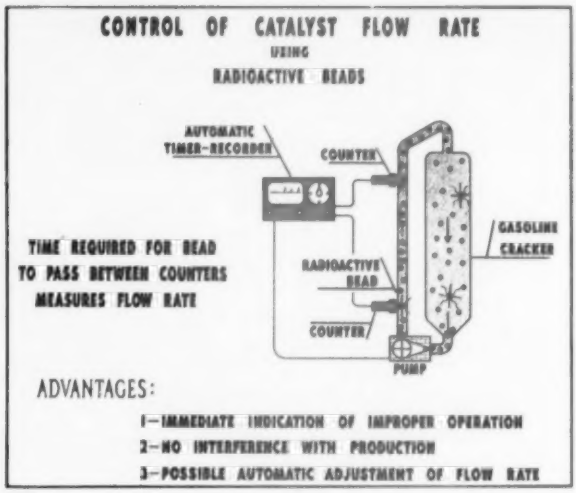
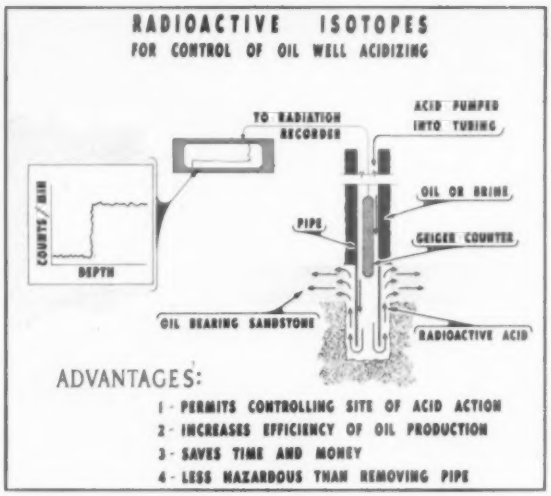
ALL W-K-M VALVES HAVE **Through-Conduit Fluid Passage • Parallel Expanding Gate Assembly**

Oversize Replaceable Seats • Double Row Thrust Bearings on Stem • Internal Lubrication





Substantial savings also have been effected in pipe-line operation by the use of radioisotopes which permit a reduction of the waste of interface products by one-third.

In production, the addition of radioactive material to the acid used in the acid treatment of oil wells permits operators to determine the depth of the acid level without removing the pipe sections through which it has been pumped into the well.

Other examples of the application of isotopes cited by Wiggin included their use to locate leaks or obstructions in buried pipes, for the improvement of lubricants, in studying reactions in the Fischer-Tropsch method for producing synthetic gasoline, in tracing the movement of oil in underground reservoirs, for oil-well logging, and for monitoring liquid levels in refinery tanks.

Types of Radioisotopes

A total of 66 types of radioisotopes have been distributed by the AEC for industrial use. The oil industry has worked with 23 of them, identified as follows:

H-3, hydrogen (tritium); C-14, carbon; Na-24, sodium; P-32, phosphorus; S-35, sulfur; Cl-36, chlorine; Ca-45, calcium; Cr-51, chromium; Fe-55 and Fe-59, iron; Co-60, cobalt; Zn-65, zinc; Se-75, selenium; As-76, arsenic; Br-82, bromine; Zr-96, zirconium; Sn-113, tin; Cd-115, cadmium; Sb-122 and Sb-124, antimony; I-131, iodine; Ba-140, barium, and La-140, lanthanum.

Organizations which have engaged in radioactive research on petroleum, and the types of isotopes used, include the following:

Union Oil Co. of California, Brea, Calif.: I-131, Cl-36 and Co-60 to study the dynamics of water-driving or gas-driving a water-oil or water-oil-gas saturated porous medium.

Shell Development Co., Emeryville, Calif.: Fe-59 to determine the amount of gear wear under various conditions of lubrication; C-14 to detect traces of antioxidants in various locations, to study the mechanism of hydrocarbon isomerization, the Fischer-Tropsch reaction, the alkylation reaction and other catalytic and noncatalytic hydrocarbon reactions.

California Research Corp., La Habra, Calif.: Se-75 to determine the fluid saturation of permeable cores.

McCullough Tool Co., Los Angeles: I-131 as a source of radiation in oil-field tests.

Shell Oil Co., Martinez, Calif.: S-35 to study the behavior of petroleum products in internal-combustion engines; Ba-140 and Zr-95 to study the flow of heavy petroleum products in pipe lines; C-14 to study the adsorptive and reactive properties of poly nuclear aromatics in complex petroleum mixtures; H-3 in the preparation of labeled hydrocarbons for petroleum research.

California Research Corp., Richmond, Calif.: Co-60 as a radiation source for pipe-line scrapers; Zr-95 as a possible interface marker in pipe-line flow; Sb-122 and Sb-124 to determine the feasibility of using irradiated oil-soluble antimony compounds as pipe-line tracers; Ba-140 and La-140 to determine effects of composition of fuel on wear rates of plungers in fuel injectors for diesel engines; C-14 to study the mechanism of catalytic hydrocarbon reactions and coke formation; Fe-59 to measure the corrosion of liquids found in oil wells to find inhibitors which might be used to reduce the destruction of well casings; Zr-95 to measure the rate of catalyst circulation in catalytic plants; S-35 to study the reactions of sulfur compounds in petroleum.

American Cyanamid Co., Stamford, Conn.: S-35, P-32 and Zn-65 to study processes taking place in a lubricating oil on addition of a lube-oil additive.

Schlumberger Well Surveying Corp., Ridgefield, Conn.: Co-60 to investigate radioactivity bore-hole logging techniques for direct measurement of underground formations.

Oil Field Service Co., Chanute, Kans.: Co-60 to determine intake rates in water-injection wells in conjunction with water-flood projects.

Massachusetts Institute of Technology, Cambridge, Mass.: C-14 to study polymerization of butadiene by the Alfin catalyst and determine if the labeled part of the catalyst remains uncombined with the rubber.

Detroit Edison Co., Detroit: C-14 to determine the chemical nature, mobility, and size of ions in liquid hydrocarbons, and to locate leaks in underground pipes.

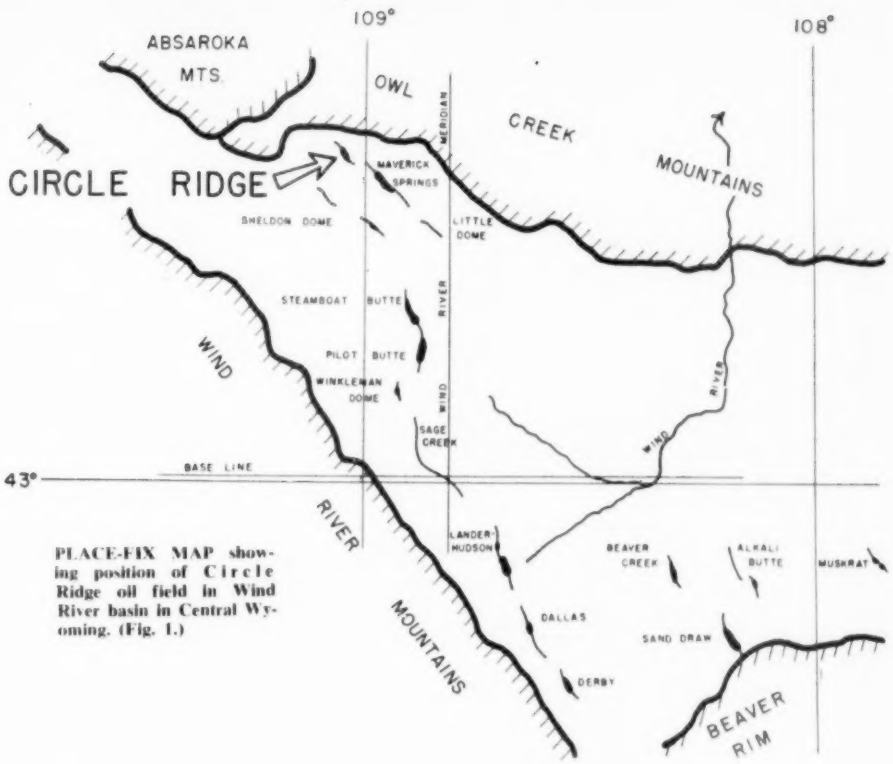
U. S. Rubber Co., Passaic, N. J.: S-35 to study the mechanism of the polymerization of synthetic rubber, and reinforcement of rubber by carbon black.

Socony-Vacuum Oil Co., Inc., Paulsboro, N. J.: Co-60 as an isotope incorporated as a salt of an organic acid and then dissolved in oil and employed as a phase location tracer; and to determine the oil, gas, and water permeability in three-phase flow in naturally occurring or artificially produced porous media; Fe-55 and Fe-59 for irradiation of silica to study gel structural properties, study mechanisms of surface wetting and corrosion of iron surfaces by organic acids.

The Texas Co., New York: C-14 to study the mechanism of catalysis in Fischer-Tropsch synthesis; and to determine the solubility of urea in mineral oil and the extent of association in solution between urea and paraffins; Co-60 to determine flow rate by location of cobalt pellets.

(Continued on page 139)

There'll Be Few Dry Holes in



PLACE-FIX MAP showing position of Circle Ridge oil field in Wind River basin in Central Wyoming. (Fig. 1.)

Wyoming's Circle Ridge Field...

despite complex and unpredictable geologic structure

by Lewis E. Beebe

ONE of the most complex producing geologic structures in the Rocky Mountain province is Circle Ridge field, Fremont County, Wyoming. Circle Ridge lies at an elevation of 7,200 ft. between the Owl Creek and Wind River ranges in the northwestern part of the Wind River basin in the central part of the state.

Structure is a tightly folded, partly overturned anticline, asymmetric to the southwest. Oil production is found in Lower Paleozoic reservoirs comprising the Mississippian Madison limestone, the Pennsylvanian Tensleep sandstone, and the Permian Phosphoria dolomite. High initial oil rates of black 23°-gravity crude are obtained from these horizons at depths of less than 2,000 ft.

The most striking structural feature of the anticline is an east-dipping thrust fault which cuts the east limb. Faulting results in repetition of the Tensleep and Phosphoria pays on the north end of the structure. From the overthrust block, there are 67 Madison, Tensleep, and Phosphoria wells now on production. Below the thrust plane, 16 wells have been completed in the Phosphoria and Tensleep reservoirs. Some wells are spudded in the Phosphoria which is brought to the surface by the overthrust east limb.

Above the fault, the reservoir has dip closure of from between 20° to 40° on the northeast, east, and southeast slopes. The fault provides west closure to the structure. Known closure in the Phosphoria dolomite is 1,400 ft. Although the field has a water drive, reservoir pressures are low and wells must be pumped. More structural detail on the north plunge of the anticline will be obtained as development progresses.

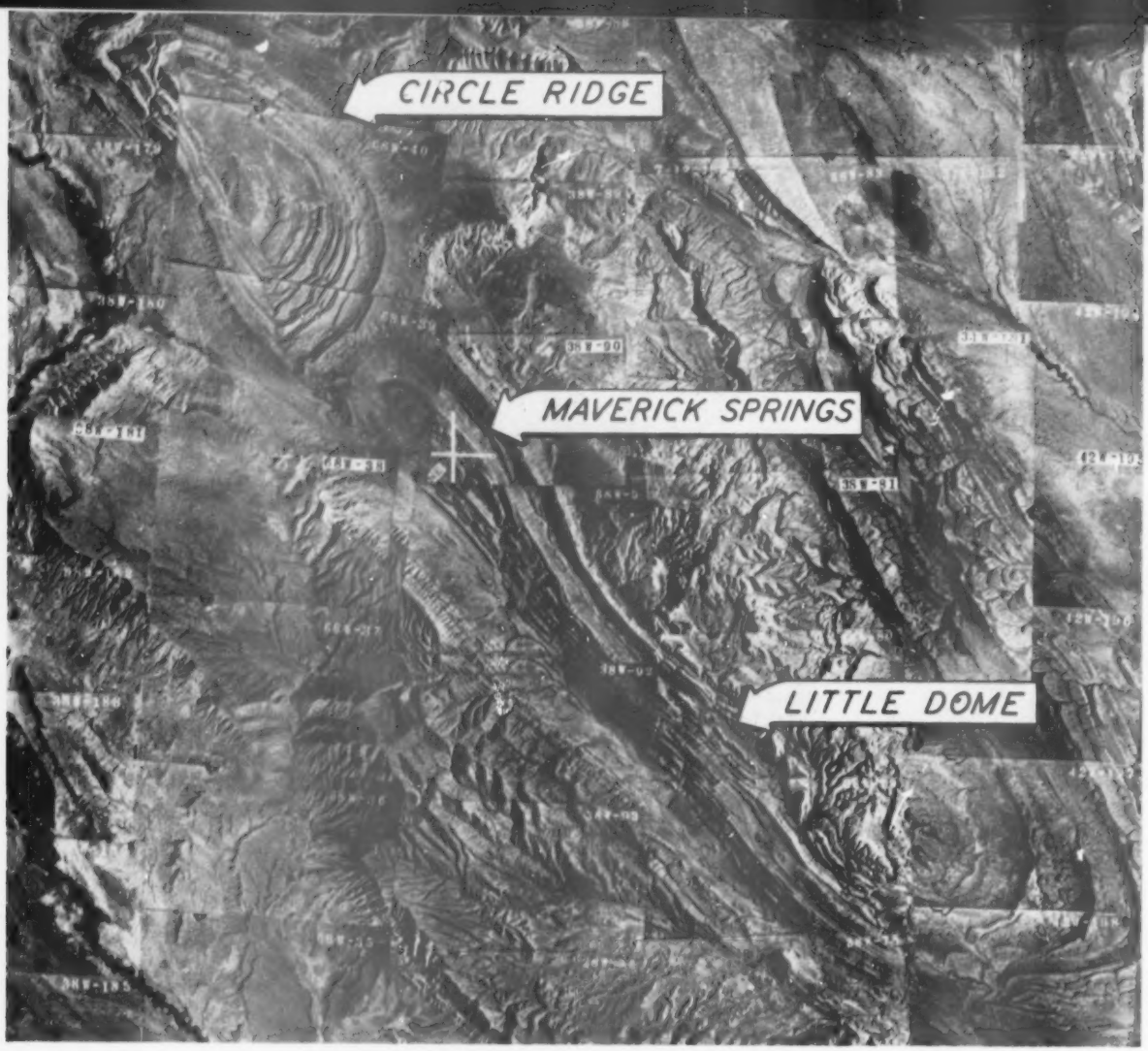
Development history . . . The first well on the structure, completed in 1923, found oil in both the Phosphoria and Tensleep formations. Development was slow and erratic for many years because of the poor market for black, low-gravity oil coupled with the lack of transportation facilities.

In 1951 an intensive development program was started by Continental Oil Co. As of June 30, 1953, Circle Ridge field had 83 wells on production from the Madison, Tensleep, and Phosphoria reservoirs.

Daily average crude-oil production for June 1953 was 3,284 bbl. for the entire field. During 1952, annual production was 341,309 bbl. and cumulative recovery to January 1, 1953, was 4,099,132 bbl. During 1953, Circle Ridge should produce a record amount of oil since pipe-line allowables have recently been increase.

Production-Structure Relations

Overthrust Phosphoria . . . Of the 87 wells drilled at Circle Ridge, 33 have been completed from the Phosphoria of the overthrust block. Pay thickness, porosity, and permeability vary from well to well, resulting in wide variations in initial production rates.



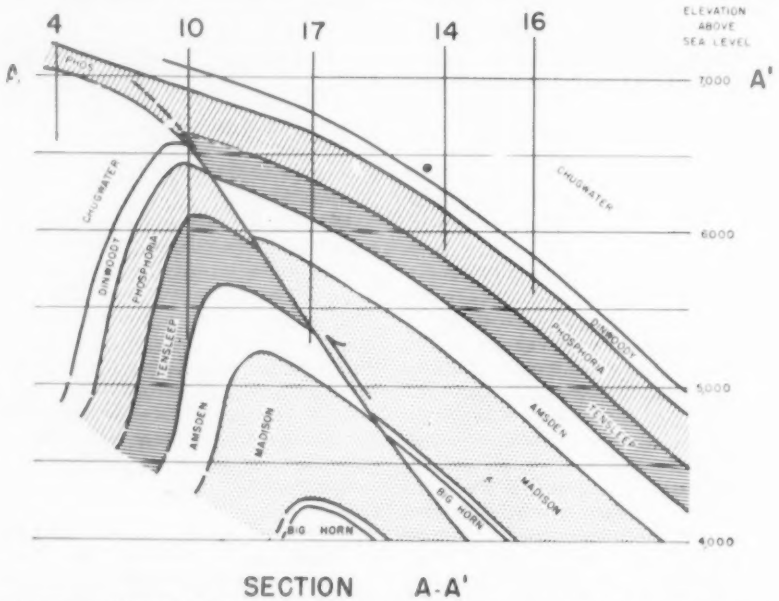
AIR PHOTOGRAPH of structure in the northern portion of Wind River basin near the south flank of Owl Creek Mountains showing position of Circle Ridge, and adjacent folds. (Courtesy, Jack Ammann, San Antonio.) (Fig. 2.)

Most wells are capable of producing between 200 and 600 bbl. per day on the pump. One well was completed for an initial of 1,020 bbl. per day. Some wells require acidization while others produce naturally.

Production rates are still limited by pipe-line capacity and market. All wells are pumped at only a fraction of their potential rate. While this reservoir exhibits an effective water drive, pressures are very low and all wells must be pumped. The crude is 23.6° gravity and has a sulfur content of about 3 per cent. The oil-water contact is +5,500 ft.

Drilling depths through the two Phosphoria pay zones vary from 1,700 ft. to the extremely shallow depth of only 277 ft. recorded for one well completed on the Phosphoria outcrop.

Overthrust Tensleep . . . A total of 32 Tensleep wells are now producing from the overthrust block. Net effect pay of the Tensleep averages 165 ft. Initial pumping potentials vary from 100



OVERTHRUST FAULT FEATURE in this geologic cross-section A-A' of Circle Ridge structure has displaced sediments in the Ordovician, Mississippian, Pennsylvanian, and Permian systems. See Fig. 4 for location of line of section. (Fig. 3.)

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RUBBER STABILIZER

Insures Maximum Drill-String Stabilization

Developed and perfected to meet the urgent need for maximum stabilization with today's high drilling speeds, and heavier weights encountered in deep well drilling, the *new* Security Neo-Red Rubber Stabilizer introduces a field-proven method of stabilization that is unsurpased in safety and efficiency.

Briefly, the Security Neo-Red Rubber Stabilizer consists of a 6-foot integral forged steel mandrel with an 18-inch rubber sleeve mounted on the recessed portion of the mandrel. The circular sleeve consists of an oil and temperature resistant rubber moulded over two forged-steel half sections. The metal portion of the sleeve fits inside the recessed portion of the mandrel, with only the rubber extending past the O. D. of the mandrel.

The rubber sleeve floats on the mandrel, providing a wide surface contact to the hole wall, thereby resisting any lateral movement of the drill collars. Stabilizer is easily mounted in drill-string and sleeve can be changed in a matter of minutes right at the rig by only one man. No welding or special tools are required to change sleeves.

Write for Bulletin 130

A multi-colored 4-page bulletin describing the new Neo-Red Rubber Stabilizer in full detail is available upon request. Send for your copy today.

Look at these Field-Proven Features . . .

1 **FLUTED CHANNELS**

Channels on interior of sleeve permit cuttings to circulate without being hung-up. Scalloped channels on cylindrical exterior insure full circulation, prevent mud and cuttings from lodging between sleeve and formation. Sleeve floats on mandrel, performs no cutting action.

2 **FAST CHANGE OVER TIME**

Each of the two lightweight sleeve sections has metal tongue and groove to facilitate ease in mounting and removing sleeve right at the rig. Sections are securely joined by seven studs on each side.

3 **SOLID ONE PIECE MANDREL**

Cut from solid steel forging for maximum strength and safety, this 6-foot mandrel has recessed area for mounting rubber sleeve firmly in position.

Designed to operate in the open hole, this revolutionary new Security Neo-Red Rubber Stabilizer assures you of maximum drilling efficiency and provides a safety margin heretofore unobtainable in steel stabilizers.

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THE AUTHOR

Lewis E. Beebe is district geologist for western Wyoming in Continental Oil Co.'s Casper division, which position he has held since April 1952. He received a bachelor of science degree in general engineering from South Dakota School of Mines and Technology in January 1943. After 14 months as an experimental engineer in the Curtiss Propeller division of Curtis-Wright Corp., he entered the U. S. Navy, he attended University of Wisconsin and received a master of science degree in geology in 1949. Joining Continental Oil on graduation, he was assigned to the exploration office in Billings, Mont., and in 1950 was transferred to Casper, Wyo., to assist in development of Sussex and Meadow Creek areas.

to more than 600 bbl. per day. Crude-oil gravities average 23.5°. Tensleep oil-water contact, found generally around +5,700 ft., is very irregular. Drilling depths through the Tensleep vary from 720 to 1,700 ft.

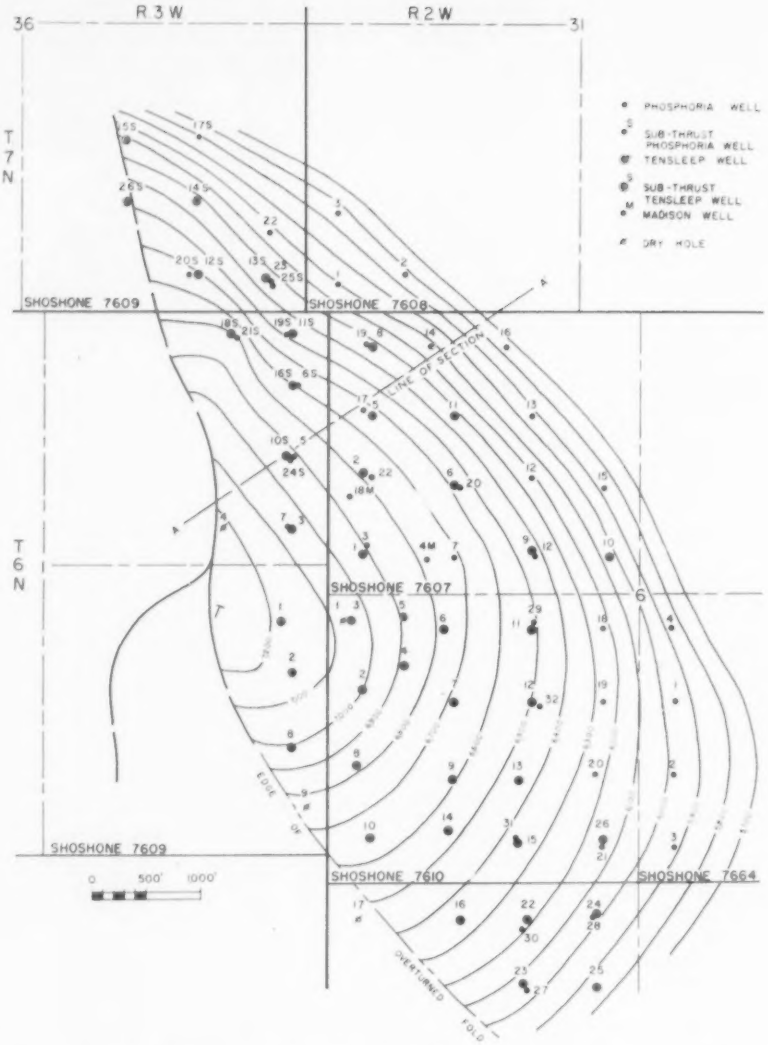
Overthrust Madison . . . Productive area of the Madison is believed to be small. To date, only two wells have been completed from the overthrust Madison. Both wells were drilled to deeper horizons and plugged back for initial production rates of about 100 and 200 bbl. of 23.4°-gravity oil. Well 7607 No. 18 penetrated 322 ft. of Madison and crossed the fault into the Tensleep where water was encountered. Well 7607 No. 4 was bottomed in subthrust Madison which had good shows but tested water.

Subthrust production . . . As of June 1953, 16 wells have been completed in the Phosphoria and Tensleep below the thrust plane. Pay sections and production rates are generally similar to those in the overthrust block. However, since the fault cuts the section at a different place at each subthrust location, each well drills a different section. Well 7609 No. 17, the deepest Tensleep test drilled so far, is bottomed at only 1,957 ft. Two wells have reached the subthrust Madison but tested water in that horizon.

Of the four failures, three were caused by structural complications, and the fourth was a lost hole. Since the operator usually can expect more than one productive horizon at each location, and can test the intervening pays on the way down to the deepest, few dry holes will be drilled at Circle Ridge, despite the complex and often unpredictable structure.

Geologic Structure

Circle Ridge is a small, asymmetric anticline situated in proximity to the south flank of the Owl Creek range in the western constriction of the Wind River basin. The anticline is one of a number of prolific oil and gas fields located on several lines of folding paralleling the foothills of the Wind River range which forms the west boundary of the basin. The field lies at an elevation of 7,100 to 7,300 ft. above sea level; it centers about the common township corner of Townships 6 and 7 N., and Ranges 2 and 3 W. (Wind River meridian), Fremont County, Wyoming.



SUBSURFACE STRUCTURE CONTOUR MAP of Circle Ridge field, Fremont County, Wyoming, mapped on top of the Permian Phosphoria formation. Contour interval is 100 ft. (Fig. 4.)

In common with most of the anticlines of the western portion of the Wind River basin, Circle Ridge is asymmetric to the southwest. Like many of these structures, Circle Ridge is cut by an east-dipping thrust fault. Asymmetrical folding and thrust faulting is related to the southward overthrusting of the Owl Creek Mountains during the Laramide deformation into what is now the Wind River basin.

Circle Ridge anticline is well named. A mile-long northwest-trending topographic depression, paralleling the axis, has cut into the red shales and siltstones of the Triassic Chugwater formation.

On the gentle east and northeast sides of the fold, concentric hogbacks of bright-colored Triassic, Jurassic, and Cretaceous rocks ring the structure. A small, rounded hill of Phosphoria dolomite rests in fault contact upon the upper beds of the Chugwater on the steeply dipping-to-overturned west flank.

Phosphoria dolomite has been brought to the surface by a thrust fault, which is the most interesting feature of the structure.

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The major fault strikes nearly north-south and dips to the east at about 45°. As shown on the cross-section, the fault has cut the east limb on the northern plunge of the anticline and has thrust a segment of the section westward overriding the subsurface axis of the anticline.

The fault and its branches provide west, updip closure for the overthrust Tensleep and Phosphoria. Wells 7609 No. 9 and 7610 No. 17, at the south end of the field, cut parts of both limbs of what must be an almost isoclinal overturned fold. Well 7610 No. 17, spudded in Triassic Chugwater, entered and drilled several hundred feet of Triassic Dinwoody and reentered the Chugwater; when abandoned it was drilling upsection in the Jurassic Gypsum Spring at 2,380 ft.

Apparently the plane of the thrust fault dives deeply southward from the east limb of the fold and passes into, or cuts through, the axial plane of the anticline, which becomes overturned to the south. Wells in the overthrust block of the south part of the field show no evidence of the fault plane coming to the surface. Drilling on the northwest plunge of the anticline has not proceeded sufficiently to date to clarify structural relationships on that limb.

Faulting provides a partially repeated pay section over much of the northern part of the field; at several locations four producing horizons (two Phosphoria and two Tensleep) are encountered.

Phosphoria on the overthrust block dips about 40° northeast and between 20° and 35° east and southeast. Dips on the overthrust Tensleep and underthrust Tensleep and Phosphoria are about the same. Proven closure on the overthrust Phosphoria is 1,400 ft.

Description of Stratigraphy — Circle Ridge Field

TRIASSIC:

Chugwater 1,250 ft.

Siltstone, silty shale and shale, red, with numerous thin beds of selenite gypsum. Some green and gray shale and gray siltstone. Several beds of fine, hard, tight, white sandstone.

Dinwoody 100 to 140 ft.

Shale, light gray to green, with silty and dolomitic streaks. Small pyrite crystals disseminated throughout. Interbedded anhydride and gypsum. Occasional oil staining.

PERMIAN:

Phosphoria 285 ft.

30 to 90 ft.

Dolomite with some dolomitic limestone and chert. Gray or tan but usually oil stained brown. Fine to coarse crystalline. Porous and saturated in zones. This is the upper productive zone of the Phosphoria.

50 to 100 ft.

Chert, shale and phosphatic dolomite and limestone. Dark gray to black. Fossiliferous. Usually dense and tight but occasionally vuggy and saturated.

100 to 115 ft.

Dolomite, gray, hard and dense except for discontinuous vuggy, stained, and saturated zones. This is the lower productive zone.

30 to 50 ft.

Dolomite, gray, hard, tight, argillaceous, with sandy zones. In the southeast corner of the field this basal section becomes almost entirely sand similar to Tensleep and probably is reworked Tensleep sand. It is productive in this area.

PENNSYLVANIAN:

Tensleep 275 ft.

Sandstone, white to gray, fine to medium grained, usually oil stained brown. Quartzose. Porous and permeable except where cemented with dolomite. Several hard, white dolomite beds near middle and base. Entire section usually completed as one producing zone.

Amsden 300 ft.

Shales, dolomites, and sands in an alternating sequence. The dolomites are light colored, tight, and dense with only occasional oil staining. The shales are green and red and often sandy. The sands are white, fine to coarse, usually well cemented with some staining.

MISSISSIPPIAN:

Madison 670 ft.

Limestone, gray, cream, tan, white, often dolomitic. Dense to coarsely crystalline, sometimes cavernous. The productive zone occurs from 265 to 300 ft. below top

DEVONIAN:

Darby 65 ft.

Dolomite, gray, green, sandy at top. Lower portion limestone, gray, green, silty and sandy. Thin, hard, tight, sandy zones throughout.

ORDOVICIAN:

Big Horn 45 ft. plus

Dolomite, tan, dense, hard, brittle with a small amount of medium grained, tight sandstone.

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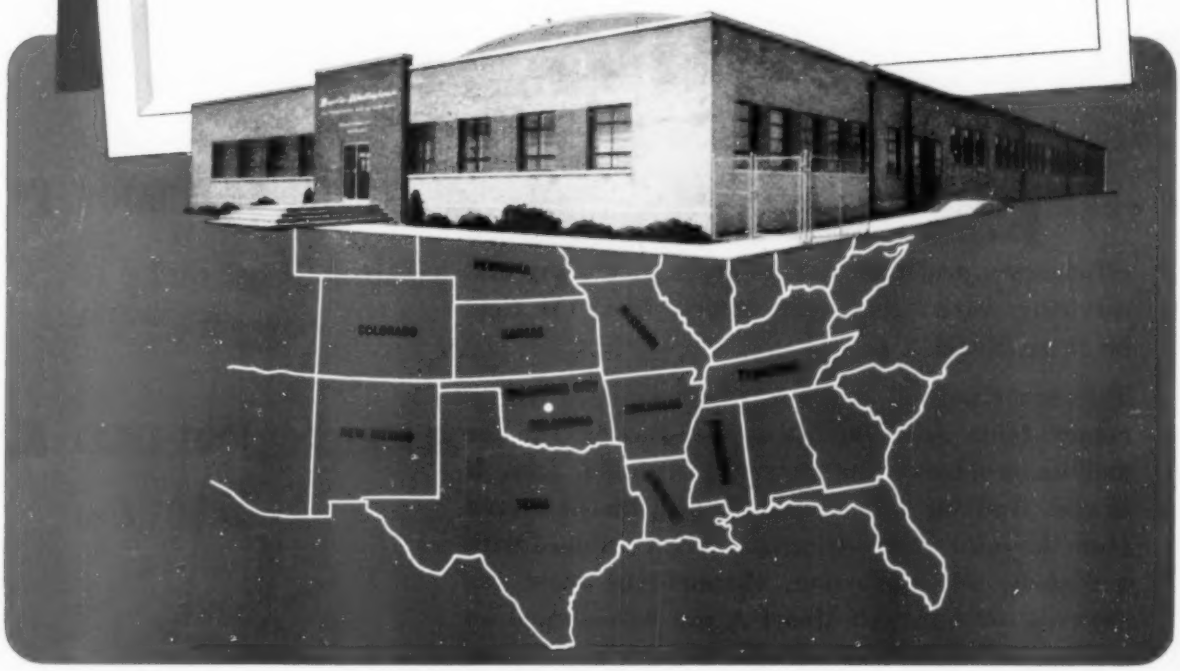

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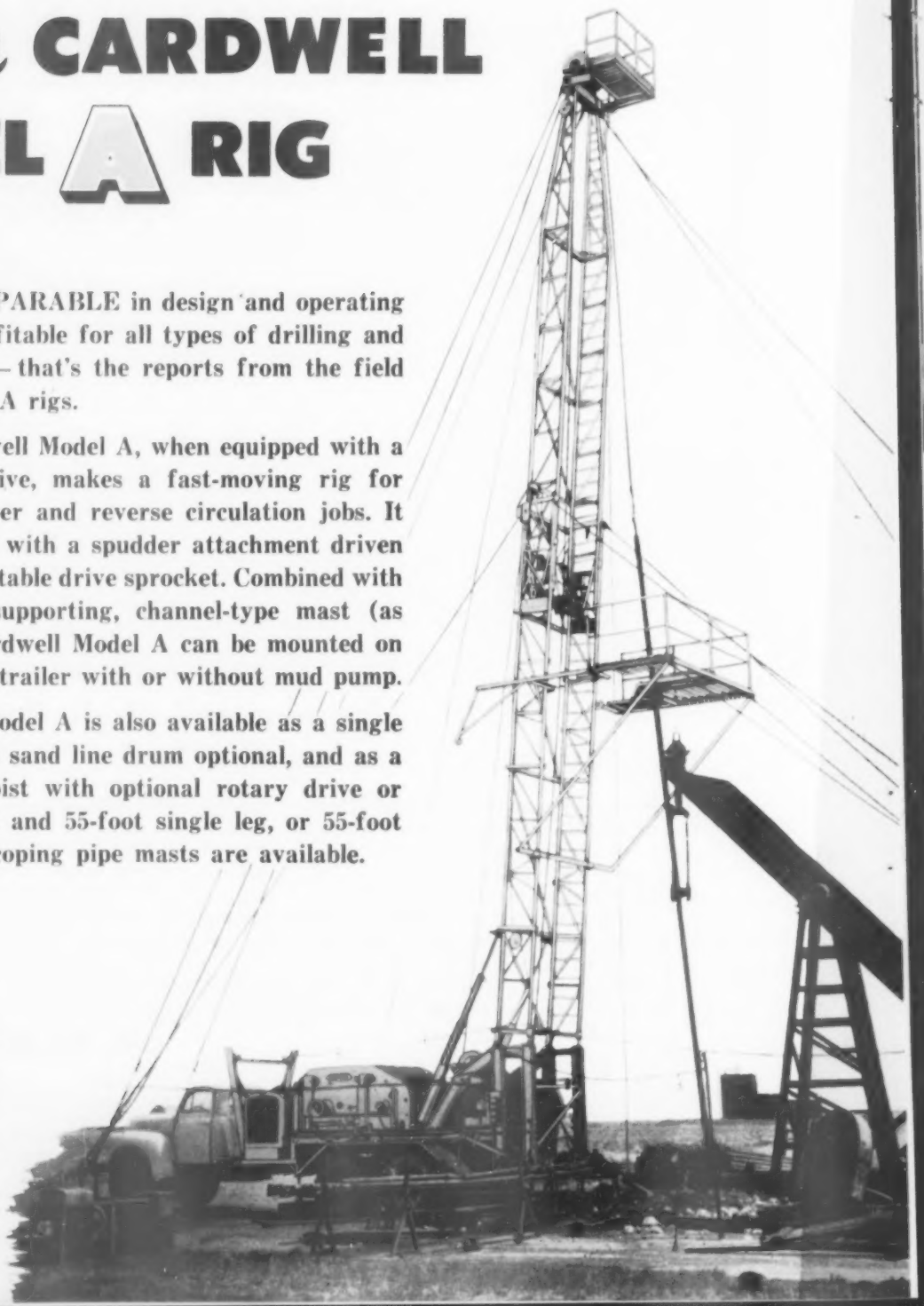
INCOMPARABLE in design and operating efficiency...profitable for all types of drilling and servicing work – that's the reports from the field on these Model A rigs.

This new Cardwell Model A, when equipped with a rotary table drive, makes a fast-moving rig for drilling, workover and reverse circulation jobs. It is also available with a spudder attachment driven from the rotary table drive sprocket. Combined with a 65-foot, self-supporting, channel-type mast (as shown), the Cardwell Model A can be mounted on a truck or semi-trailer with or without mud pump.

The Cardwell Model A is also available as a single drum hoist with sand line drum optional, and as a double drum hoist with optional rotary drive or spudder. 48-foot and 55-foot single leg, or 55-foot double leg telescoping pipe masts are available.



65-foot telescoping, high-tensile steel, four-leg mast has a capacity of 75,000 lbs., yet maintains a low roading height. Rotary table folding base is available.

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- **CABLE TOOL "DRILLING-IN"**
  to 3,700 feet
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  to 5,000 feet

65-foot, self-supporting mast is carried on the truck or trailer mast supports, and can be raised and telescoped to full height in a few minutes.

All drives, including main drum, sand line drum and rotary table operate through Cardwell "Flex-Disc" air friction clutches. Engagement of these clutches is provided by air controls mounted in a panel at driller's position. Controls for either truck or skid level mounting are available. Torque converters can be used on all models instead of the standard five-speed gear transmission. The Cardwell "Hi-Lo" drum drive, consisting of two "Flex-Disc" air friction clutches, provides two speeds to the drum and rotary from torque converter output.

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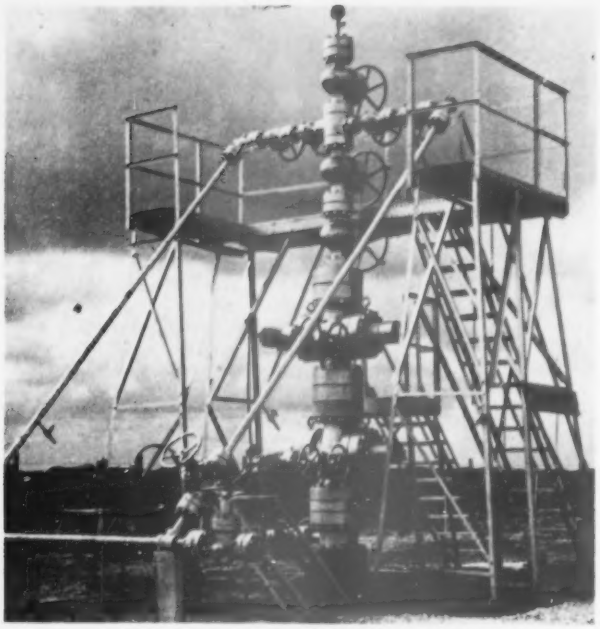

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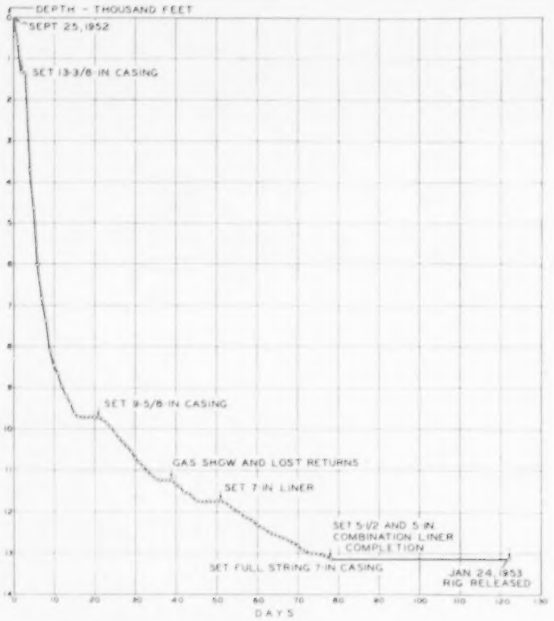
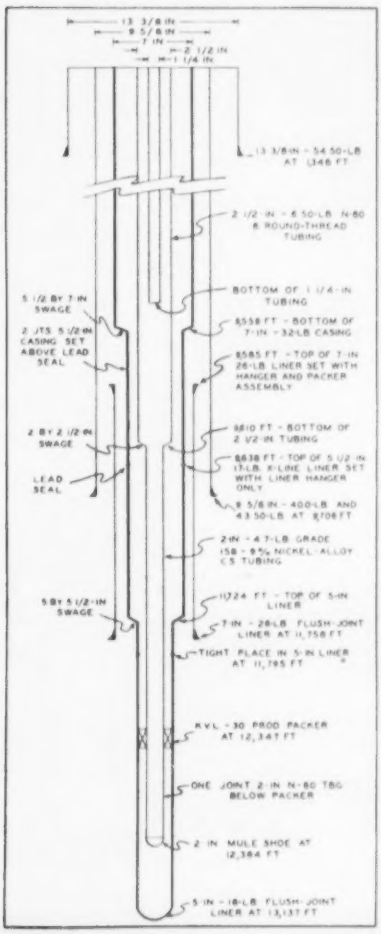

DEPTH - THOUSAND FEET
SEPT 25,1952
SET 13-3/8 IN CASING
SET 9-5/8 IN CASING
GAS SHOW AND LOST RETURNS
SET 7 IN LINER
SET 5 1/2 AND 5 IN COMBINATION LINER COMPLETION
SET FULL STRING 7 IN CASING
JAN 24 1953 RIG RELEASED
DAYS

PENETRATION CURVE showing drilling performance at Union Sulphur & Oil Corp. A-1 Walker in Lake Arthur field, Jefferson Davis Parish, Louisiana. Note that the first 9,000 ft. of hole was drilled in about 11 days.


13 3/8 IN
9 5/8 IN
7 IN
2 1/2 IN
1 1/4 IN
13 3/8-IN - 54.50-LB AT 1346 FT
2 1/2 -IN - 6.50-LB N-80 8 ROUND-THREAD TUBING
BOTTOM OF 1 1/4-IN TUBING
5 1/2 BY 7-IN SWAGE
6558 FT - BOTTOM OF 7-IN - 32-LB CASING
2 JTS 5 1/2-IN CASING SET ABOVE LEAD SEAL
8585 FT - TOP OF 7-IN 26-LB LINER SET WITH HANGER AND PACKER ASSEMBLY
2 BY 2 1/2-IN SWAGE
8810 FT - BOTTOM OF 2 1/2-IN TUBING
LEAD SEAL
8838 FT - TOP OF 5 1/2-IN 17-LB K-LINE LINER SET WITH LINER HANGER ONLY
9 5/8-IN - 40.0-LB AND 43.50-LB AT 8706 FT
2-IN - 4.7-LB GRADE 158 - 8% NICKEL-ALLOY CS TUBING
5 BY 5 1/2-IN SWAGE
11724 FT - TOP OF 5-IN LINER
7-IN - 26-LB FLUSH-JOINT LINER AT 11,758 FT
TIGHT PLACE IN 5-IN LINER AT 11,795 FT
KVL - 30 PROD PACKER AT 12,347 FT
ONE JOINT 2-IN N-80 TBG BELOW PACKER
2 IN MULE SHOE AT 12,384 FT
5-IN - 18-LB FLUSH-JOINT LINER AT 13,137 FT

SETTING DIAGRAM shows surface, protection and long strings, liner settings and spaghetti string employed in A-1 Walker well.

Spaghetti String in Tubing

. . . affords high-pressure-well control

by Joseph A. Kornfeld
District Editor

USE of a spaghetti string of 1¼-in. tubing inside of the regular tubing string serves many purposes in operating and controlling a gas-distillate well in south Louisiana.

This well, which exhibits one of the highest well-head pressures ever recorded in the Gulf Coast province, is Union Sulphur & Oil Corp. A-1 Walker in Lake Arthur field of Jefferson Davis Parish, Louisiana. It was completed on January 23, 1953, for 100 bbl. of condensate per day and 2.4 M.M.c.f. of gas per day through a 7/64-in. choke; initial tubing pressure on the 1¼-in. string was 7,750 psig. through a 7/64-in. choke and shut-in well-head pressure on the same string was 8,350 psig. The well produces through casing perforations from 12,390 to 12,410 ft. in the Camerina "A" zone of Oligocene age.

One application of the 1¼-in. upset tubing string is to facilitate application of chemical treatment to mitigate tubular-goods corrosion. Also, in the event of an emergency, this slim tubing string would enable crews to circulate mud into the well to kill the flow.

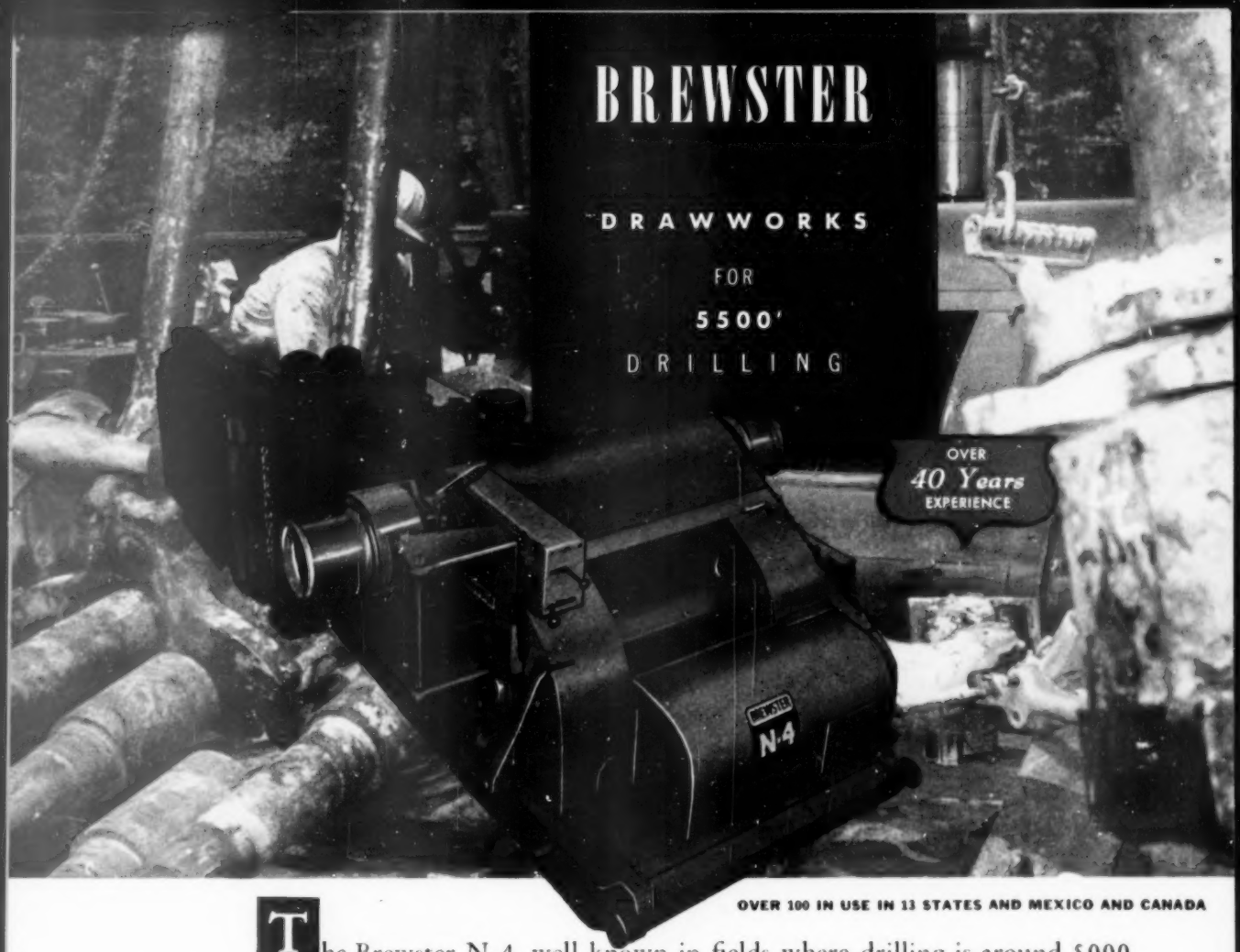
Rig description . . . This well was drilled with a Model 34-10-FE draw works mounted on a 30 by 136-ft. steel derrick on a 14-ft.-high substructure. Prime movers were two steam engines, a 14 by 14-in. and a 12 by 12-in., powered by four boilers. Pumps employed were two 8 by 18 by 20-in. units and a 7¾ by 16¼ by 20-in. unit.

Total drilling days required were 78; the well was spudded on September 25, 1952, and total depth of 13,142 ft. was reached on December 11, 1952. Total rig time to release date of January 24, 1953, was 122 days.

Bore-Hole and Casing Data

In the accompanying well diagram, several departures from conventional casing and tubing settings may be noted. In summarization, there are regular, surface, protection, and liner settings. However, in addition, there is a combination production string swaged above the liner setting.

Moreover, the tubing string is enlarged from 2-in. to 2½-in. in the upper portion of the well to accommodate the 1¼-in. slim-tubing arrange-



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The Brewster N-4, well known in fields where drilling is around 5000 feet, has earned its reputation for handling tough jobs with ease. Since its introduction in 1947, the N-4 has drilled millions of feet of hole, at a saving in time for drillers and a saving in money for drilling contractors.

FLEXIBLE POWER — Made with single diesel or twinned gasoline engines... 300 available horsepower for drilling to 5500' with 4½" drill pipe. May also be equipped with 200 horsepower engine for 4500' drilling.

TORQUE CONVERTER DRIVE — Fluid, cushioned power affords smooth flow of power... handles sudden loads easily without overloading engine. Truck type transmission available on 200 h.p. models.

SPLIT RIG DESIGN — Compact, easy to transport, quick to rig up, quick to tear down... designed for use with separately powered pump.

HIGH AND LOW SPEED DRUM CLUTCHES — Air operated friction type... controlled by a single valve which enables driller to change speeds without stopping drawworks.

ROTARY CLUTCH — Air operated, friction type... gives the driller smooth positive control of rotary.

CLUTCHED CATHEAD SHAFT — Prevents turning of cathead when not in use.

POSITIVE CLUTCH ON LOW SPEED DRIVE — An added precaution in the event of air clutch failure or other emergency.

OPTIONAL WIRE LINE REEL — Has reel capacity of 8500 feet of 9/16" line.

OPTIONAL HYDROMATIC BRAKE — A 15" hydromatic brake may be installed as additional equipment. Reduces wear of drum brake, provides smooth, gradual braking power.

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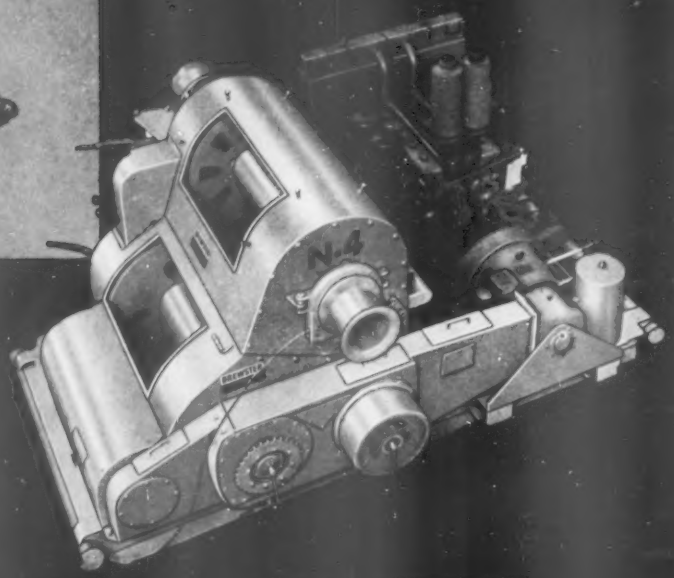
The N-4 may be equipped with a single diesel or twinned gasoline engines.

The engines of two-engine models are compounded to produce 300 horsepower. Torque converters provide cushioned flow of power.



Models are available with wire line reel for swabbing, coring, etc.

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SPECIFICATIONS

ment described here. Details of each casing, liner, and tubing setting are described in order as follows:

A single 17½-in. bit was used to cut the surface hole in which 13⅜-in. casing was set at 1,348 ft. Pipe was cemented with 700 sacks mixed with 8 per cent gel, followed by 100 sacks treated with 2 per cent calcium chloride.

The shoe was drilled with a 12¼-in. bit, 13 bits being used to cut the protection hole to 9,076 ft. Protection pipe was 9⅝-in. of mixed 40.0 and 43.5-lb. weights cemented at that depth with 250 sacks mixed with 1 per cent Flocele; this treatment was followed by 750 sacks of neat cement.

Liner settings . . . Hole was then reduced to 8⅝ in. and 18 bits of this size were used to drill to 11,758 ft. At that point because of last returns, crews set with hanger-and-packer assembly a 7-in. flush-joint liner; it was cemented in the 8⅝-in. hole with 550 sacks of neat cement. Top of the 7-in. 26-lb. liner was 9,585 ft.

A 6⅛-in. hole was then cut to 13,142 ft., total depth; 27 bits were required to obtain this footage. A combination 5-in. and a 5½-in. liner was set and cemented in the 6⅛-in. hole at 13,137 ft. with 600 sacks of cement. Top of the liner (9,638 ft.) was squeezed with 200 sacks of cement.

Production string . . . Two joints of 5½-in. pipe and a full string of 7-in. casing with a lead seal were set at 9,638 ft. at the top of the combination 5 and 5½-in. liner and cemented with 150 sacks of neat cement.

Joe M. Baker, production superintendent for Union Sulphur, designed the 10,000-psi. w.p. christmas tree shown in an accompanying photograph. This type tree has been used successfully on eight high-pressure Gulf Coast well.

Completion Practice

Gun perforator was run and the well perforated from 12,390 to 12,410 ft. Then a combination tubing string of 2½ and 2-in. tubing was run into the hole. The string was 2½-in. 6.5-lb. tubing set to 9,610 ft.; the remainder of the string was 2-in. with a 2-in. mule shoe set at 12,384 ft. A production packer was mounted on the string one joint above the mule shoe.

Open-ended spaghetti tubing string of 1¼-in. was swung from the well head to 9,498 ft. The well was washed in through the 1¼-in. tubing.

Initial tubing pressure measured on the 1¼-in. tubing registered 7,750 psig. on a 7/64-in. choke. Shut-in well-head pressure on this slim-size tubing was 8,350 psig.

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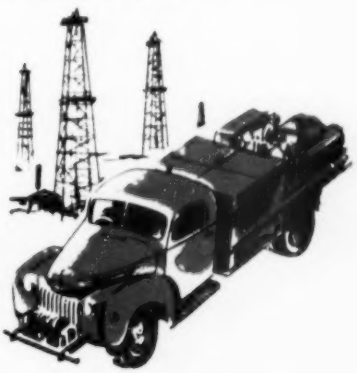

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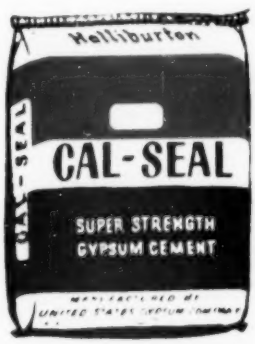

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Hydraulic Fracturing

. . . of oil and gas wells

RESEARCH . . . Three of Continental Oil Co.'s production research men at hydraulic fracture test unit, Ponca City, Okla., research laboratories: Jack Reynolds, Mel Albright, and the author, Roscoe C. Clark, Jr.

19 Key Factors . . .

Affecting behavior of formations under hydraulic pressure

1 The effect of plasticity should be considered when predicting the behavior of formations under hydraulic pressure.

2 Tensile and compressive strengths as they are measured under surface conditions are not directly related to the fracture pressures of cement cubes or underground rocks.

3 The radius of the well bore moderately affects the fracture pressures.

4 The radius of the well bore is inversely proportional to the fracture pressure.

5 Fracture pressures may be affected by the temperature of the material being fractured.

6 Repeated stresses (fatigue) do not decrease fracture pressures within the number of repetitions experienced in oil-field operations.

7 Fracture pressures increase with the quantity of overburden; however, they appear to be indirectly, rather than directly, affected by overburden.

8 Relatively high fracture pressures will be obtained if the fracturing fluid does not enter the formation to be fractured.

9 The fracture pressures will be moderately reduced if fracturing fluid penetrates uniform permeability.

10 The reduction in fracture pressures obtained when the fracturing fluid enters uniform permeability is comparable to the reduction in fracture pressures obtained by increasing the hole size.

11 Fracture pressures will be reduced considerably if the fracturing fluid penetrates small cracks in the rock or streaks of permeability interspersed in zones of relatively impermeable rock.

12 Nonpenetrating fracturing fluids having high fluid loss characteristics will fracture formations at lower pressures than those having low fluid loss characteristics.

13 The pressures required to fracture can be increased considerably by adding an effective lost-circulation material to a nonpenetrating-type fracturing fluid.

14 Relative to characteristics of fracturing fluids, maximum fracture pressures will be obtained using a low-fluid-loss fracturing material which contains an effective lost-circulation material.

15 If the fracturing fluid penetrates the formation, the lowest fracture pressures will be experienced in formations having least homogeneous permeability.

16 The viscosity of a fracturing fluid does not affect fracturing pressures except that the higher the viscosity the lower will be the pump rate required to obtain the fracturing pressure.

17 Fluid saturation in the formation to be fractured has little or no effect on fracturing pressure.

18 The formation pressure has little or no effect on the fracturing pressure.

19 The most realistic approach to predicting fracture pressures for oil and gas wells is a statistical analyses of the fracture pressures already experienced.

CONOCO'S Standardized cement cubes, for hydraulic fracturing tests. The cubes and accompanying cores show three states: (1) unbroken, (2) vertical fracture, (3) horizontal fracture.

by Roscoe C. Clark, Jr.

THE advent of deep-drilling operations where high-density drilling muds must be used and the more recent hydraulic fracturing processes for stimulating oil and gas production have caused the technical aspects of hydraulic fracturing to become one of continually increasing economic importance.

Fracturing formations, which have been penetrated by a well bore, with hydraulic pressure is not new and considerable information has been published on this subject. However, the preponderance of the data has been developed by the use of mathematics under the assumption that the formations to which hydraulic pressure is applied are impermeable, homogeneous, and isotropic. This work has been helpful in establishing some of the factors which must be considered in studying hydraulic fracturing and in evaluating their relative importance. A number of factors, however, have been omitted in these studies and in no case have all the factors affecting the behavior of formations under hydraulic pressure been assembled into one study.

It is the object of this article to present the results of a study conducted in an effort to isolate all of the different factors affecting the fracturing of formations by hydraulic pressure and to evaluate their effect on and relative importance to the subject.

A detailed study of a number of mathematical analyses of hydraulic fracturing revealed that in each case an assumption was made that the formation being fractured was impermeable, homogeneous, and isotropic. Most formations have some permeability; there are almost no formations which are homogeneous or isotropic, and there are a considerable number of additional factors which will affect fracturing by hydraulic pressure. Therefore it was believed that the most practical procedure for obtaining information on the mechanics of fracturing formations by hydraulic pressure was first to list all factors which might influence fracture behavior and then to study each factor to determine its effect on and relative importance to the breakdown of formations by hydraulic pressure.

The factors which are believed to affect hydraulic fracturing results are.

1. Plasticity of formations.
2. Tensile and compressive strength of formations.
3. Well-bore size.
4. Temperature of formations.
5. Repeated stresses, or fatigue.
6. Overburden.
7. Characteristics of the fracturing fluid.
8. Homogeneity of formations.
9. Fluid saturation in formations.
10. Formation pressure.
11. Rock permeability.
12. Rock porosity.
13. Conditions of stressed formations.

Each of the above factors was studied separately in an effort to determine its relative effect on the fracturing or breakdown of formations by hydraulic pressure.

General Procedure and Test Apparatus

Information was obtained in this study by reference to the literature and by conducting small-scale fracturing tests in the laboratory. Test work consisted for the most part of fracturing simulated formations under various controlled conditions wherein all factors but the one being evaluated were maintained constant. The standard simulated formations used in this study are illustrated in Fig. 1 (see Appendix). They consisted essentially of cement cubes 5 by 5 by 5 in. penetrated to a depth of 3 in. by a ⅜-in. cylindrical hole.

The permeability of the set cement used in the test cubes measured less than .05 md. using air as the flowing fluid in a standard permeameter.

Results and Discussion

Plasticity of formations . . . This may be defined as the amount of distortion the material will exhibit between its yield point and its point of rupture. Sandstones, limestones, dolomite, and most other rocks exhibit little plasticity under surface conditions, the yield point and the point of rupture occurring almost simultaneously.

No definite quantitative data could be obtained to prove or disprove that plasticity is a property of rocks under bottom-hole conditions; however tests by Foppl, Karman, and Boker[22] with rock materials, marble, and sandstone and by Brown[23] with concrete showed

that under conditions of high hydraulic pressure these materials, although brittle under ordinary conditions of loading, become plastic. Adams and Williamson[7] found that under hydraulic pressures of 2,000 to 3,000 megabars, glass, granites, gabbros, marble, and basalt changed measurably in length. Sudbury dibase, a rock formation, was found to change in volume as pressures were applied. This change is illustrated in Fig. 6 (see Appendix).

If the overburden or stresses resulting from the folding of rocks affect the rocks in a manner similar to that of hydraulic pressure, it is possible that rocks encountered in well drilling may possess some degree of plasticity and that when they are subjected to hydraulic pressure additional plasticity may be imparted to them.

It was found in the preliminary tests that the hydraulic pressures required to fracture cement cubes were considerably in excess of those calculated by the thick-wall-cylinder formula based on elastic behavior of the cement. For example, these formulas indicate that the tensile stress exerted on the cement at the well bore equals, or nearly equals, the hydraulic pressure inside the well bore. This distribution of stress should produce a fracture in the cement when the internal hydraulic pressure equals the tensile strength of the cement. This, however, was not the case because at a cement tensile strength of 180 psi., the cubes would be expected to fracture at or near an internal pressure of 180 psi. An average pressure of 1,300 psi. was required to fracture the cubes.

It is believed that the cement cubes used in these tests were essentially impermeable, homogeneous and isotropic; therefore inasmuch as the actual fracture pressures were seven times the calculated pressures, it is concluded that thick-wall-cylinder formulas based on elastic behavior of cement and formations do not apply.

Nadai[20] presents a formula for calculating bursting pressures of thick-wall cylinders composed of material behaving as a plastic body for a tangential or hoop stress:

$$S_r = So/3\,(1 + 2 \ln c/r)$$
$$S_t = So/3\,(1 - 2 \ln c/r)$$
$$S_z = 2So/3 \ln c/r$$

where:

S_r = radial stress
S_t = tangential stress
S_z = longitudinal stress
So = yield point (tension or compression which are assumed to be equal)
c = radial distance from center of cavity to depth to which yielding has penetrated
r = radial distance from center of cavity

In this formula the factor "c," radial penetration of yielding, could not be satisfactorily determined; however, if it was assumed to be .278 in. radially from the center of the well bore, a figure which seems to be reasonable, then the calculated stress on the cement at the well bore will be 180 psi. (the tensile strength) at an internal pressure of 1,300 psi. (the fracture pressure). Based on these data it appears that the property of plasticity may be a major factor in determining the hydraulic pressures which will be required to fracture formations and may also be a major factor in determining the characteristics of fractures obtained by hydraulic pressure.

Tensile and Compressive Strength

Sufficient standard cubes (24) were hydraulically fractured by the standard test procedure to evaluate the effect of tensile strength on fracture pressure. Since it has been generally accepted that cement compressive strengths vary directly with tensile strengths at curing times less than 7 days (6 to 10 times greater depending on the cement), it is believed that this evaluation can be considered valid for compressive as well as for tensile strengths.

From the tensile strengths and fracture pressures of the 24 cubes tested (as presented in Table 1, Appendix) it was observed that the fracture pressure does not vary with tensile strength, measured under surface conditions. It was also observed from Table 1 that the fracture pressures are for the most part much higher than the tensile strengths, ranging to more than eight times higher in extreme cases. This serves to further invalidate the thick-wall-cylinder formulas based on the elastic behavior of the material being fractured.

Well-Bore Size

In order to evaluate the effect of hole size, tests were conducted using the modified standard test cube illustrated in Fig. 7 (see Appendix). This cube consists essentially of a 10 by 10 by 5 in. test cube, again of neat cement. The diameter of the holes was varied from .25 to .95 in., and a 1½-in. nipple was set 1½ in. into the cement around the test holes. Five cubes were prepared for each of the following diameter holes:

.025 in.
.50 in.
.70 in.
.95 in.

To conduct the test drilling mud having a standard A.P.I. Code 29 water loss of 8 cc. in 30 minutes was placed in the test holes and filled to the top of the 1½-in. nipple. Pressure connections were attached to the 1½-in. pipe nipple and pressure applied (using the pumping equipment illustrated in Fig. 3) until the cube was fractured.

As in previous tests it was found that the fractures created in each group of cubes extended in various directions from the test hole. It is believed that this indicates, for all practical purposes, that test cubes could be considered as being of infinite thickness.

The results of these tests are illustrated graphically in Fig. 8 (see Appendix) wherein hole diameters are plotted versus fracture pressures. The tensile strength of the set cement used in these tests was 180 psi.

It may be observed in Fig. 8 that fracture pressures varied inversely with hole size. (These pressures were higher than the fracture pressures obtained in all other tests, probably due to the reinforcing effect of the 1½-in. nipples.) For example, doubling the hole size resulted in reducing the fracture pressure approximately 8 per cent.

It is believed that the above data indicate the effect of hole size has a bearing on breakdown pressures encountered in field operations.

Temperature of the Formations

A number of tests were conducted to evaluate the effect of temperature, using standard test cubes and the standard test procedure. A number of standard test cubes were heated to various temperatures in water baths, and then fractured by hydraulic pressure. The results of these tests indicated that temperature may have some effect on the fracturing pressure of cement specimens; however, the data obtained were erratic and could not be correlated. Other investigators[23] have reported that temperatures between 80° and 200° F. did not appreciably affect the fracturing pressure of sandstone specimens.

Repeated Stresses

Rock failure under fatigue is a possibility in rotary-drilling operations where repeated applications of pressure are experienced in pump surges and the piston effect accomplished by rapid lowering of the drill pipe into the hole.

This factor was evaluated using the standard test cubes by determining the fracture pressure of five cubes using the standard test procedure followed by testing two additional cubes poured from the same batch of cement by applying pressure to within 200 psi. of the determined fracture pressure, releasing the pressure, and repeating this operation for 1,000 cycles. Oil-base

mud (zero fluid loss, A.P.I. Code 29 test) was used for the pressuring medium.

It was found in these tests that the five cubes fractured by the standard test procedure ruptured at pressures varying from 1,100 to 1,300 psi. Neither of the two cubes subjected to the repeated stresses was ruptured (at a pressure of 1,000 psi.) until the conclusion of the test, when the pressure was increased until a fracture was obtained. The two fracture pressures obtained were at 1,150 and 1,250 psi.

From the above results it appears that fatigue has little or no effect on decreasing breakdown pressures, at least within the limits normally encountered in drilling operations.

Characteristics of Fracturiag Fluid

A number of tests were conducted to evaluate this factor. The test specimens for these tests consisted of standard test cubes and of permeable test cubes 10 by 10 by 5 in. made of 5:1 sand:cement with a ⅜-in.-diameter hole penetrating 3 in. of the 5 in. of the cube.

The standard test procedure was used in fracturing all the cubes with the exception that the characteristics of the fracturing fluid were altered. Standard test cubes were used in evaluating all effects, except the effect of fluid penetration and the effect of fluid loss, which tests were conducted fracturing the above-described larger permeable cubes with penetrating and nonpenetrating fluids respectively. The fluid loss characteristics of the nonpenetrating fluids were varied also.

Results of these tests are tabulated in Table 2 (see Appendix), which data can be summarized as follows:

1. Fluid penetration of 1.75 in. reduced the fracture pressure 8.4 per cent.

2. Penetration of the fracturing fluid into the permeable cube produced a reduction in fracture pressure comparable to that experienced for a comparable enlargement of the bore holes.

3. Viscosity of the fracturing fluid had little or no effect, providing that equal penetrations are considered for all viscosities.

4. Fluids possessing fluid loss characteristics (that is nonpenetrating fluids) required greater pressures to cause fracturing.

5. Fracture pressures varied inversely with the fluid loss of the fracturing fluid. The variation in fracture pressures was moderate.

6. Use of lost circulation materials in the nonpenetrating fracturing fluid increased the pressure required to fracture by 25 per cent.

Based on the results of the above tests, it is concluded that pressures re-

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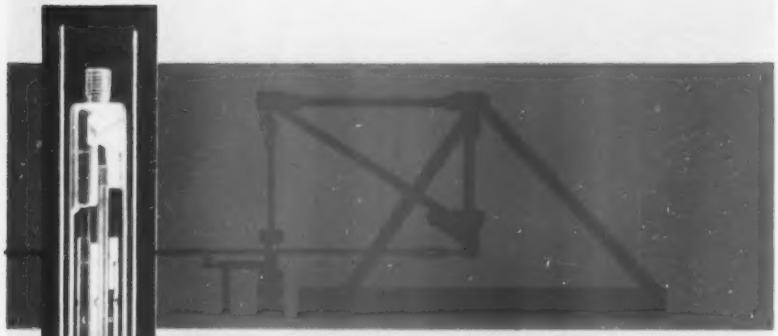

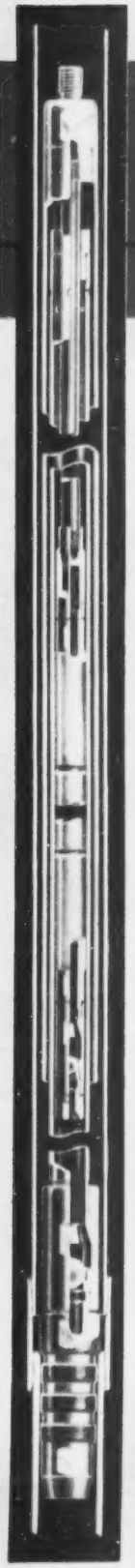

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quired to fracture homogeneous formations can be varied as much as a factor of 2.5 by the proper selection of fracturing fluid.

Considering the problem of lost circulation, the results of these tests indicate that maintaining a low-fluid-loss mud will reduce the chances of lost circulation. In addition the maintenance of an adequate quantity of a good lost-circulation material in a drilling mud at all times may increase the potential breakdown pressure as much as 25 per cent.

Effect of Homogeneity

All of the tests reported so far were made using test cubes which were as homogeneous as it was possible to make them. This was necessary because it was desired to maintain uniform all of the variables except the one being evaluated. Since, however, no formations encountered in field work can be expected to be homogeneous or isotropic, it was considered necessary to study this factor in as much detail as the accuracy of results would permit.

In conducting this study 20 sandstone cores, each 4 in. in diameter and 5 in. long, were obtained and ⅜-in.-diameter holes were drilled 3 in. into each core. Ten of the cores were fractured using S.A.E. 10 lubricating oil and the other 10 using oil-base mud (zero fluid loss). Pressure was maintained with the pump and packer assembly shown in Figs. 2 and 3. (See Appendix). The cores were all obtained from one well and one formation.

The results of these tests are presented in Table 3 (see Appendix). The cores tested contained bedding planes which appeared as horizontal dark streaks through the cores. In every case where a horizontal fracture occurred, it occurred along one of these bedding planes.

An analysis of the data (Table 3), indicates that:

1. Lower fracture pressures were encountered using a fluid which penetrated the rock.

2. Horizontal fractures occurred as a result of failure of one of the bedding planes.

3. The bedding planes were more permeable than the remainder of the rock and were therefore penetrated first by the fracturing fluid.

4. Penetration of the bedding planes by the penetrating fluid caused low fracture pressures and horizontal fractures.

5. Horizontal fractures were obtained using a fracturing fluid which could not penetrate the rock.

6. These horizontal fractures occurred as a result of one bedding plane which possessed considerably less strength than the rock.

7. Vertical fractures predominated when fracturing the cores with a nonpenetrating fluid.

An analysis of the results obtained in these tests reveals that vertical fractures should be expected to occur except in the case where one or more weak bedding planes exist. In these cases very low fracture pressures may be obtained if a penetrating fluid is used as a fracturing fluid and is given time to penetrate the bedding planes.

It can be shown that very large uplifting thrusts can be obtained by injecting fluids into bedding planes at relatively low pressures. For example, the penetration of 1 ft. into a bedding plane by a fluid under an average pressure of 5,000 psi. will produce a vertical thrust of 1,130 tons (in addition to the effect of the pressure of the fluid in the well bore).

The use of a nonpenetrating fluid having low-fluid-loss characteristics resulted in a predomination of vertical fractures and in higher fracture pressures. These higher pressures were principally a result of lack of penetration into the bedding planes or localized fissures. Penetration into relatively uniform permeability appeared to lower the fracture pressures; however, the degree of lowering was not nearly the magnitude of that experienced when injecting fluids into localized areas.

Results of these tests serve to further confirm the difficulty of calculating with any degree of accuracy the breakdown pressures to be expected for different formations. The fracture pressures in these tests varied from 800 to 6,000 psi., a variation of 750 per cent for one formation and one well.

Concerning the problem of lost circulation, the results substantiate the conclusions made in the study of the effect of fracturing fluid characteristics, that is, that the lost returns can be reduced by using low-fluid-loss muds and very likely effectively reduced by maintaining lost-circulation materials in the mud at all times.

Considering squeeze cementing, substantially lower breakdown pressures can be expected when fracturing a formation having weak bedding planes if some of the fracturing fluid is allowed to penetrate the formation. In this case the fracture should be expected to occur along a bedding plane.

In the event it is desired that fractures occur parallel to the bedding plane, such as might be the case when bedding planes are horizontal and a horizontal cement pancake is desired as a result of squeeze cementing, it may be desirable to use a nonviscous breakdown fluid and allow the fluid to penetrate the rock at a pressure lower than the normal breakdown pressure for that

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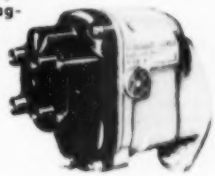

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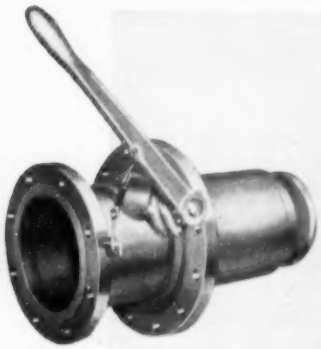

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area. After some penetration has occurred the pressure can be increased slowly until a breakdown is accomplished. This procedure should insure a horizontal fracture with little danger of the occurrence of a vertical fracture. For example, in Table 3 (Appendix) the average pressure required to obtain horizontal and vertical fractures were as follows:

To obtain vertical fractures	4,250 psi.
To obtain horizontal fractures	2,570 psi.

These data may also shed some light on the type of fractures obtained during hydraulic fracturing operations for stimulating production. If the pressure required to obtain a breakdown is below average, it is probable that a horizontal fracture was obtained. If the breakdown pressure is above average, then the chances are that a vertical fracture was formed.

Effect of Fluid Saturation

In the evaluation of the effect of fluid saturation, 10 standard test cubes were poured using a 5:1 sand:cement mortar in order to obtain a measurable amount of permeability. The average permeability of these cubes was 250 md. Five of the cubes were saturated with kerosine by injecting kerosine into the cubes through the simulated well bore using the packer assembly previously described. The cubes were fractured using the standard test procedure using SAE 10 lubricating oil as a fracturing fluid (to insure injection of fluid into the cubes before fracturing occurred).

The results obtained in these tests are shown in the tabulation below:

Condition of cube	Fracture pressure psi.	Tensile strength, psi.
Unsaturated	900	90
Unsaturated	800	90
Unsaturated	1,000	90
Unsaturated	850	90
Unsaturated	950	90
Saturated	800	90
Saturated	950	90
Saturated	900	90
Saturated	900	90
Saturated	950	90

Based on the above data it is concluded that fluid saturation has little or no effect on the hydraulic pressures required to fracture formations.

Effect of Formation Pressure

When fracturing formations with a penetrating-type fracturing fluid, the injection rate required to produce the fracturing pressure varies inversely with the formation pressure. This is because the higher the formation pressure the lower the differential pressure between well bore and formation for a given well bore pressure. This will reduce the rate of injection and facilitate a more rapid pressure buildup.

Rock Permeability

The results conducted under "Characteristics of Fracturing Fluids" and "Homogeneity" indicate that when using penetrating-type fracturing fluids, the pressures required to obtain a fracture varied inversely with the permeability.

In both homogeneous and heterogeneous types of specimens the fracture pressures were decreased as a result of injection of fracturing fluid into the specimen prior to the attainment of fracture. The greater the permeability, the larger the volume of fracturing fluid which will be injected, resulting in low fracturing pressures.

Considering the use of fracturing fluids of the nonpenetrating type, permeability will affect fracturing pressures only insofar as it affects the wall-building properties of the nonpenetrating fluid. Inasmuch as it is generally accepted that the fluid loss of drilling muds does not vary with permeability, it appears that permeability has little or no effect on fracture pressure of formations when using a fracturing fluid which will not penetrate a formation.

Rock Porosity

Generally two factors may be expected to be affected by porosity. These factors are tensile or compressive strength and a cross-sectional area against which hydraulic pressure in the pore spaces may act. All other factors being equal, rock strength should vary inversely with rock porosity.

The increase in cross-sectional areas against which pressure may be exerted is important, at least from the standpoint of the phenomena discussed by Nadai[20] wherein entry of the pressuring fluid into the pore spaces of thick-wall-cylinder test specimens caused the specimens to "explode" or to break from within the solid material. In this case it is visualized that the breakdown pressures could vary considerably as an inverse function of porosity.

It is therefore believed that a porous rock may be expected to fracture at a lower pressure than a rock containing little or no porosity, provided the pressuring fluid is allowed to enter the pore spaces of the rock.

Conditions of Stressed Formations

It is possible that some rock formations exist in a state of stress due to folding or faulting in the rock. If this is true, then the type and degree of stress might be expected to affect the magnitude of the hydraulic pressures required to fracture the formations. It is also possible that some rocks, particularly those at greater depths, may possess sufficient plasticity that they will, during some interval of time, flow or rearrange themselves to a degree sufficient to relieve all or part of the stresses.

Unfortunately no data could be obtained which would support any theory of the behavior of underground rocks when placed under a stress; therefore no conclusions on this factor have been made.

Effect of Overburden

Grebe[10], Pitts[21], Yuster and Calhoun[32], and Dickey and Andresen[6] found that the pressure gradient in the earth due to overburden is approximately 1 psi. per foot of depth. Howard and Scott[15] found that in 276 wells the pressure required to fracture formations at 8,000 ft. of depth varied from .67 to .98 psi. pressure per foot of depth. In this same study it was found that a pressure of .35 to .85 psi. per foot of depth was required to inject fluids into formations at 8,000 ft. of depth after the formation had been fractured.

An analysis of these data suggests that when injecting fluids into a fracture in a well, the total overburden is not lifted but that only sufficient overburden is lifted to provide space in the fracture for the injection of fluid. The pressures required to inject fluid into fractures appear therefore to be more a relation to the compressibility of the formations (or a relation to the stress-strain diagram in compression of the fractured formation). If this is true, then the formation of either horizontal or vertical fractures results in the compression of rock in the horizontal or vertical planes respectively.

The pressures required to fracture rocks and to inject into the fractures are then a function of the compressibility of the rock which in turn may be a function of the amount of overburden. In homogeneous formations, therefore, the application of hydraulic pressure sufficient to cause fracturing should always cause fracturing in the vertical plane; however, fracturing along bedding planes could be expected to predominate when penetrating type fluids are used as a breakdown material.

Discussion

It is believed that this is the first integrated study of all the factors affecting the fracturing of formations by hydraulic pressure. Almost every one of the factors evaluated is sufficiently complex to warrant many hours of additional study in order to obtain complete results. It is one of the purposes of this article to evaluate each of these factors in as much detail as possible and to stimulate further study on each factor which appears to ma-

terially affect the results of hydraulic fracturing.

Of particular interest is the subject of plasticity. It is believed that a quantitative analysis of this factor would go a long ways toward enlightenment of the behavior of rocks under hydraulic pressure. Additional work on the effect of tensile and compressive strength is desirable. The strength measured under surface conditions appears to have little effect on fracturing pressures, as was found in this study; however, the strength exhibited by rocks under bottom-hole conditions can be directly related to fracturing pressures.

Additional studies should be conducted in an effort to determine the relation between surface and bottom-hole tensile and/or compressive strengths.

The conditions of stressed formations due to faulting or folding are at present indeterminable. Prospects are that this factor will remain so unless a study of plasticity of rocks under temperatures and pressures comparable to those encountered in oil and gas wells discloses that stressed rocks flow plastically to the extent that the stress is relieved in a finite length of time.

The greatest interests in this study were the effects exhibited by the various types of fracturing fluids. Most of the fractures studied must be accepted as they are with no possibility of altering or controlling them; thus, it is encouraging to discover a factor that has a relatively great effect on the results of hydraulic fracturing.

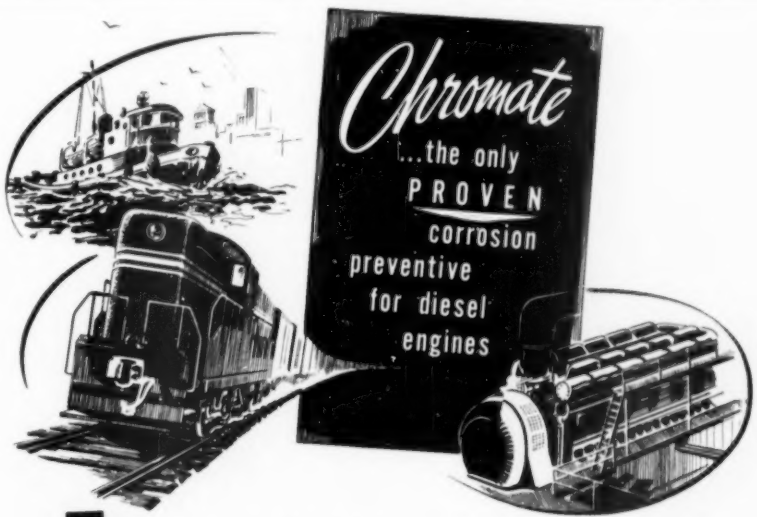
With regard to the type of fractures formed, the data indicate that, when fracturing underground formations, both horizontal and vertical fractures may be expected. In homogeneous formations vertical fractures should invariably occur; however, formations are not usually homogeneous, and bedding planes or horizontal planes of weakness are sometimes so weak that horizontal fractures may occur.

Of even greater importance in the formation of horizontal fractures is the increased permeability along bedding planes and the possibility of injecting low-viscosity fracturing fluids into these bedding planes in order to obtain horizontal fractures at low breakdown pressures. The results of this study indicate that the penetration of these bedding planes by the fracturing fluid will almost certainly result in a fracture along the bedding plane.

The effects of overburden is not yet entirely clear. Indications are that during the formation of a fracture only a limited amount of overburden above the fracture is actually moved. If this is true, then the space created by the fracture is obtained by compressing a small portion of the overburden in either a vertical or in a horizontal direction; and as such would depend on the elasticity or plasticity of the rocks being compressed, it may be that the elasticity or plasticity is so closely affected by overburden that the effect obtained can be interpreted directly in terms of quantity of overburden.

Many times in hydraulic fracturing operations, the formation is broken down using crude oil, after which a viscous fracturing fluid is injected for the purpose of extending the fracture. One of the disadvantages of using crude oil or penetrating-type fracturing fluids, is that the fractures formed when using them will nearly always occur along weak planes. This means that, if there are any shale streaks in the formation or available to the fracturing fluid by way of weak primary cementing conditions, the fracture very likely will be formed in one of these non-productive zones.

Casing seats should be protected insofar as practical when conducting hydraulic fracturing operations. Cement will frequently not bond tightly to rock; therefore a small space may be left between the cement and the formation. If the formation below the casing is well consolidated and does



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not possess small fractures, zones of weakness, or streaks of relatively high permeability, the fracture may occur behind the casing to allow the fracturing fluid to enter into nonproductive zones somewhere up the hole.

Considering the results of this study in the light of lost-circulation difficulties, the only factor affecting formation breakdowns over which any degree of control exists is the characteristics of the drilling fluid. It is therefore fortunate that this factor is one of the most important in determining the magnitude of the pressures required to produce fractures.

Pump surges and increased pressures caused by rapid lowering of the drill pipe may sometimes become sufficiently high to establish a breakdown; however, it is doubtful if the breakdown pressure will be decreased to any degree by the continuous application and removal of pressure (fatigue) caused by pressure surges or lowering of drill pipe.

Acknowledgments

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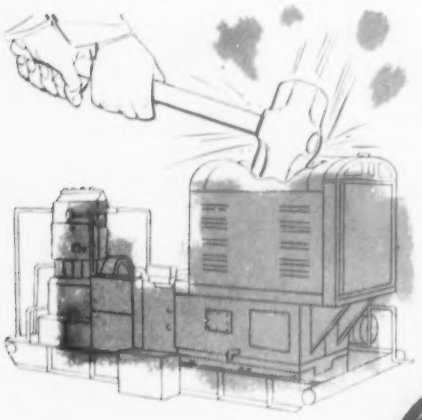

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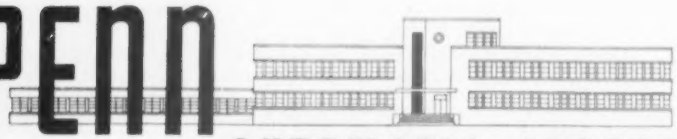

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Appendix . . . to Hydraulic Fracturing

The cement cubes were formed by mixing neat cement to a slurry weight of approximately 18 lb. per gallon and pouring the cement slurry in 5 by 5 by 5-in. cardboard boxes. A 3/8-in. steel rod was then inserted in the center of the mold to a depth of 3 in. At the time of the initial set of cement, the rod was removed. For each group of the above molds that were poured, a group of tensile molds were also poured, and the tensile strength of the cement was determined at the time that the cube was tested. The cubes described above will henceforth be referred to as standard test cubes.

Tests were conducted by inserting a packer (see Fig. 2) 1 in. into the hole, setting the packer, attaching to it a hydraulic pump (see Fig. 3), and applying pressure until the cube was fractured by the internal hydraulic pressure. As a rule pressure was applied as rapidly as possible. The usual time required to obtain a fracture after pressure was first noted on the gage was 1 to 2 seconds. Unless otherwise noted a heavy lubricating oil was used as a pressuring medium. The above-described procedure will henceforth be referred to as the standard test procedure.

Before the above-described standard test cubes were used, it was considered necessary to establish if they would behave generally as infinitely thick formations penetrated by a well; therefore tests were conducted to determine if the cubes would behave as if they were infinitely thick, rather than as thick wall cylinders (which would be affected by the ratio of the inside to the outside diameter). In addition a test was conducted to determine if the fracture pressures were re-

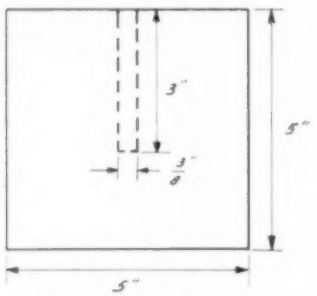

Fig. 1—Standard test cube.

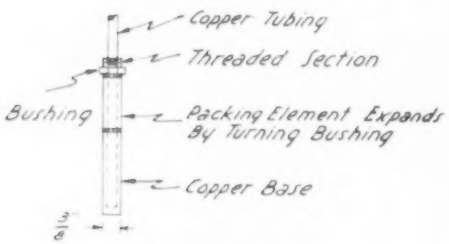

Fig. 2—Packer assembly.

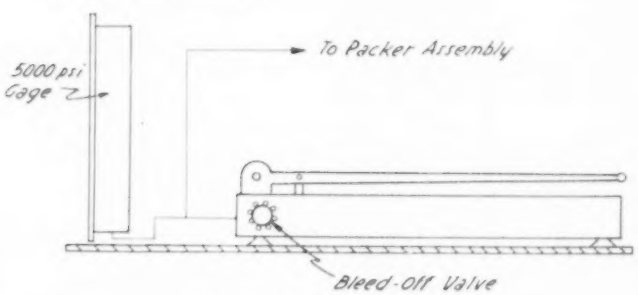

Fig. 3—Pump and gage assembly.

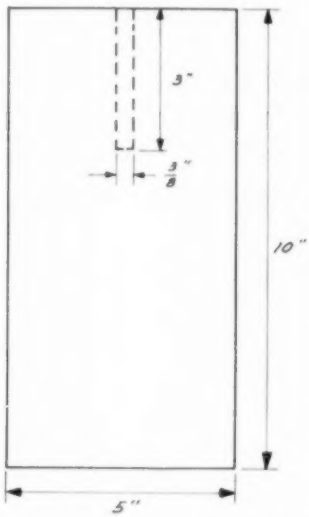

Fig. 4—Long cube used to test effect of infinite thickness below well.

TABLE 1—COMPARISON OF TENSILE STRENGTH AND FRACTURE PRESSURE

Tensile strength, psi.	Fracture pressure, psi.
150	900
150	1,300
150	900
157	1,100
157	1,100
157	1,100
157	1,100
157	1,100
180	1,550
180	1,300
180	1,400
540	1,300
540	1,300
285	900
285	900
250	600
250	750
420	500
420	950
170	1,150
170	1,150
350	1,800
350	1,400
350	1,400

TABLE 2—EFFECT OF FRACTURING FLUID CHARACTERISTICS ON PRESSURES REQUIRED TO OBTAIN FRACTURES

Fluid*—	A.P.I. Code 29 fluid loss, cc./30 min.	Penetration, in.	Fracture pressure, psi.
10 wt. oil		4.25	400
10 wt. oil		4.20	450
10 wt. oil		4.25	450
10 wt. oil		1.75	900
10 wt. oil		1.75	900
10 wt. oil		1.75	650
10 wt. oil		1.75	600
10 wt. oil		Slight	900
10 wt. oil		Slight	750
10 wt. oil		Slight	900
10 wt. oil		Slight	700
10 wt. oil		Slight	900
95 wt. oil		1.75	600
95 wt. oil		1.75	900
95 wt. oil		1.75	800
95 wt. oil		Slight	900
95 wt. oil		Slight	750
95 wt. oil		Slight	900
Drilling mud	9		2,000
Drilling mud	9		1,900
Drilling mud	17		1,500
Drilling mud	17		1,600
Drilling mud	17		1,650
Drilling mud	27		1,500
Drilling mud	27		1,400
Drilling mud	46		1,500
Drilling mud	46		1,400
Drilling mud	46		1,300
10 wt. lube oil*		Slight	1,400
10 wt. lube oil		Slight	1,400
10 wt. lube oil		Slight	1,300
10 wt. lube oil		Slight	1,500
10 wt. lube oil		Slight	1,500
Drilling mud	9		1,650
Drilling mud	9		1,600
Drilling mud	9		1,700
Drilling mud†	9		2,100
Drilling mud†	9		2,100
Drilling mud†	9		2,250
Drilling mud†	9		1,900
Drilling mud†	9		2,000

Note: The 10 wt. oil was 10 cp. viscosity, the 95 wt. was 570 cp.

*Remainder of tests conducted using standard test cubes. †Containing 16 lb./bbl. of Tufplug Fine.

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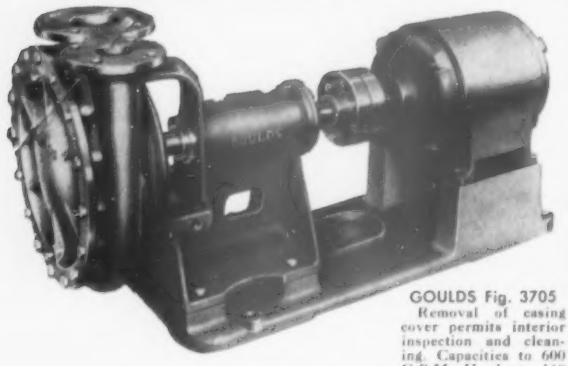

GOULDS Fig. 3705
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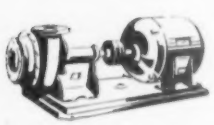

GOULDS Fig. 3169
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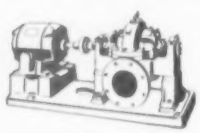

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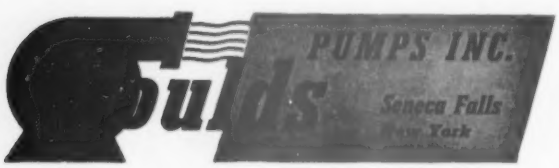

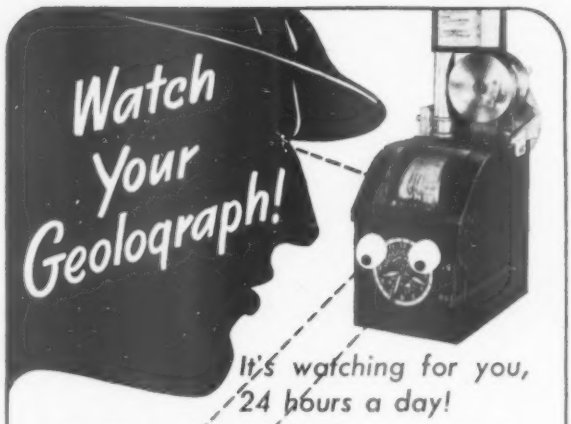

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Fig. 5—Photograph of test cubes.

TABLE 3—HYDRAULIC PRESSURES REQUIRED TO FRACTURE SANDSTONE CORES

Fracturing fluid—	Fracture pressure, psi.	Type of break
10 wt. lube oil	3,400	Vertical
10 wt. lube oil	2,700	Horizontal
10 wt. lube oil	2,200	Horizontal
10 wt. lube oil	3,800	Vertical
10 wt. lube oil	5,000	Horizontal*
10 wt. lube oil	2,800	Horizontal
10 wt. lube oil	4,800	Vertical
10 wt. lube oil	4,750	Horizontal*
10 wt. lube oil	900	Horizontal†
10 wt. lube oil	800	Horizontal†
Oil base mud	6,000	Vertical
Oil base mud	3,500	Vertical
Oil base mud	2,800	Horizontal
Oil base mud	3,000	Horizontal
Oil base mud	4,800	Vertical
Oil base mud	2,100	Horizontal
Oil base mud	3,200	Vertical
Oil base mud	2,000	Horizontal
Oil base mud	4,500	Vertical
Oil base mud	1,900	Horizontal

*Fracture occurred below well. †Fluid injected before break occurred.

lated in any way to the thickness of the cube below the bottom of the hole.

To conduct the test five standard cubes were poured and an additional five test specimens were molded, having dimensions of 5 in. by 5 in. by 10 in. with a test hole extending 3 in. into the center of the specimen parallel to its long axis (see Fig. 4). The tensile strength of the cement in these cubes was 180 psi. at the time of testing. The 10 cubes were fractured, using the standard test procedure.

In each test the fracture extended away from the hole in a different direction, varying from extension to the short side to extension to the corner (see Fig. 5). No particular direction predominated. It is believed that this indicates the cube had behaved essentially as a medium extending an infinite distance in all directions perpendicular to the well bore. (Data have since been presented[11] which indicate that thick wall cylinders behave as infinitely thick cylinders when the ratio of the external to the internal diameter reaches a value of 10). The fracture pressures obtained in these tests are as follows:

Description of specimen—	Fracture pressure, psi.
Standard cube	1,300
Standard cube	1,200
Standard cube	1,500
Standard cube	1,400
Standard cube	1,250
5 by 5 by 10-in. cube	1,350
5 by 5 by 10-in. cube	1,450
5 by 5 by 10-in. cube	1,300
5 by 5 by 10-in. cube	1,200
5 by 5 by 10-in. cube	1,250

These data indicate that the ratio of the depth of the hole penetrated in the test specimen to the thickness of the specimen had no effect on the fracture pressure.

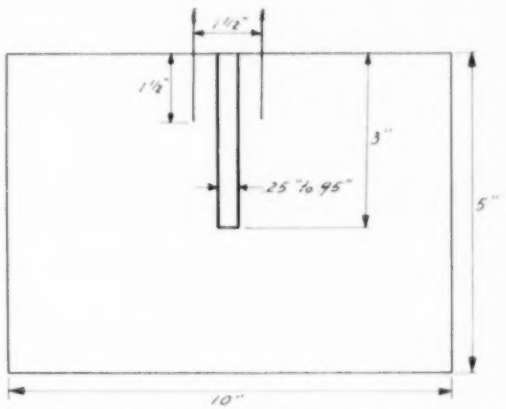


Fig. 7—Test cube used to evaluate the effect of hole size.

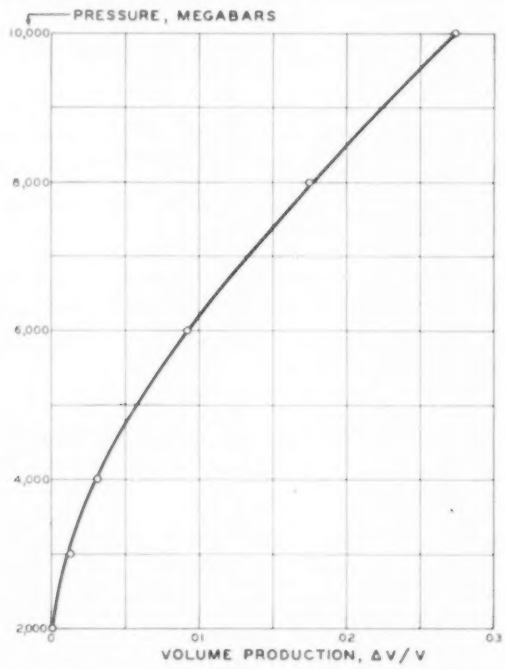


Fig. 6—Effect of pressure on reducing the volume of Sudbury dibase.[3]

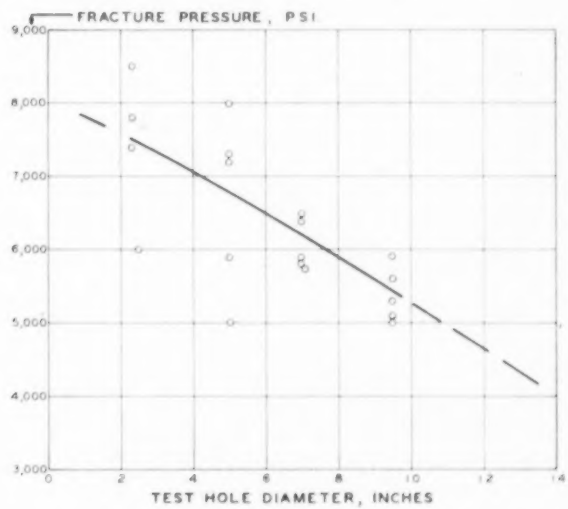
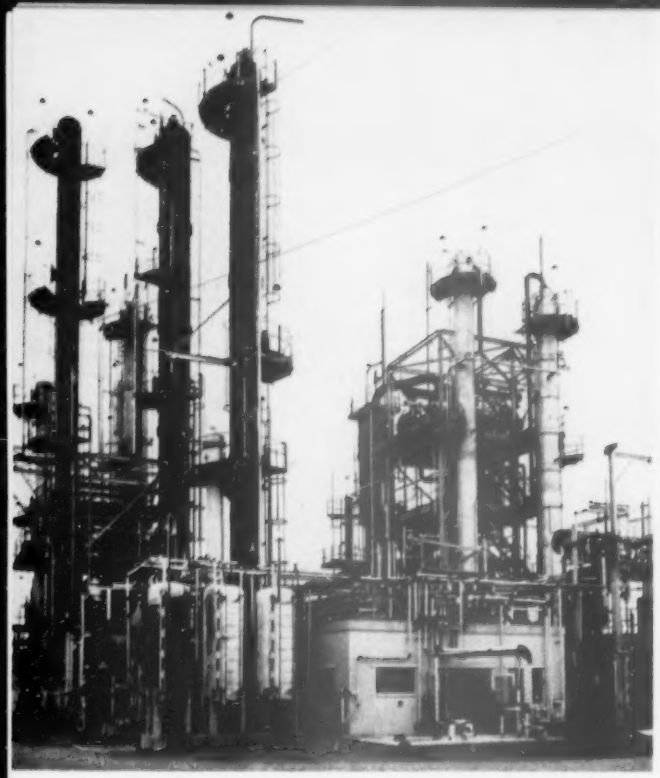


Fig. 8—Effect of hole size on fracture pressures.



New B.A.—Shawinigan, Ltd., plant with central control building in foreground. Tall towers center and left are fractionating towers for separation and purification of phenol and acetone. At right are cumene oxidizing towers and cleavage towers.

Main pump house is equipped with electric-motor-driven units. Pump house is centrally located and houses 75 process pumps, compressors, and vacuum pumps plus refrigeration facilities necessary to process control.

PETROCHEM REPORT

Phenol Synthesized From Cumene . . .

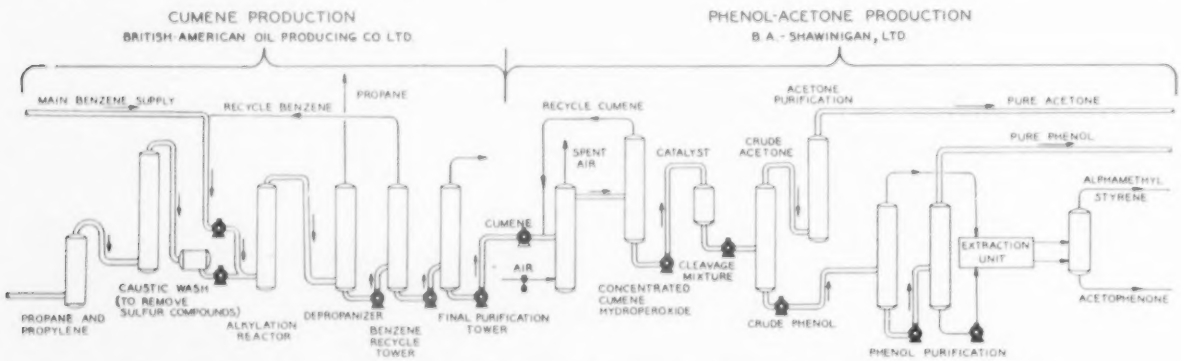
at new B. A.-Shawinigan plant at Montreal

Plant has sufficient capacity to supply nation's present needs for that chemical

THE first commercial unit to synthesize phenol from cumene is now in operation for B.A.-Shawinigan, Ltd., Montreal, Que. The new plant represents the first venture into petrochemicals for the two joint owners of the Canadian company—British American Oil Co., Ltd., and Shawinigan Chemicals, Ltd.

The plant occupies 4 acres of a 21-acre tract located adjacent to British American's 45,000-bbl. per day refinery, which will permit future expansion for manufacture of other petrochemicals. With a rated capacity for 13,000,000 lb. of phenol per year, the new plant will supply all of the nation's present needs for that chemical. The attendant production of about 8,000,000 lb. of acetone will go far in meeting Canadian requirements for that chemical as well.

Cumene feed stock for the chemical plant is produced by British American at the nearby refinery. A propane-propylene stream from the refinery's light-ends-recovery system is first sub-

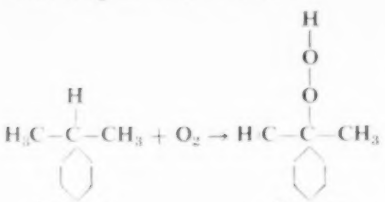


Schematic flow diagram for manufacture of phenol and acetone from cumene in new B.A.-Shawinigan plant.

jected to caustic wash for removal of sulfur compounds. Propylene is then reacted with benzene, using a phosphoric acid catalyst supported on Kieselguhr. Alkylation to form cumene takes place at about 500° F. and 400 psi. During this operation, some byproducts are formed and separated for other applications. The British American unit is capable of producing at the rate of about 19,000,000 lb. of cumene per year.

Oxidation and cleavage of cumene is undertaken in the B.A.-Shawinigan plant. The process, originally reported by Hock and Land in Germany in 1944, has been developed commercially by Hercules Powder Co., of Wilmington, and Distillers Co., Ltd., of Edinburgh, Scotland. This licensed process gives better reaction rates and higher yields of acetone and phenol than the original German process.

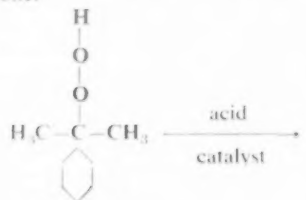
The oxidation of cumene with air in the presence of a suitable control material, takes place at moderately elevated temperatures, as follows:



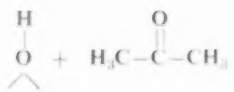
Cumene — Cumene hydroperoxide

This reaction may be limited to any desired degree, and unreacted cumene may be recycled to obtain higher efficiencies and lower byproduct formation. In the B.A.-Shawinigan operation, only minor amounts of byproduct dimethylbenzyl alcohol and acetophenone are formed.

The cumene hydroperoxide is concentrated by separation and recycling of unreacted cumene. In the presence of an acidic catalyst, the peroxide is split at slightly elevated temperature to form substantial yields of phenol and acetone:



Cumene hydroperoxide



Phenol — Acetone

Under properly controlled conditions, the cleavage of the cumene hydroperoxide to form phenol and acetone, occurs almost to the exclusion of side reactions. The dimethylbenzyl alcohol formed as a byproduct during cumene oxidation is converted by dehydration in this catalytic operation, to form alpha-methylstyrene.

The crude phenol-acetone mixture together with byproducts is split in a distillation tower. Acetone, taken overhead is stripped of water and run to storage in purity to meet United States Pharmacopoeia and British standard specification. The same purity of phenol is obtained from two-stage distillation for separation of alpha-methylstyrene and acetophenone. Minor production of mesityl oxide and the higher phenols formed by condensation reactions, is obtained in this process. Close process control employing ultraviolet and infrared spectrophotometers for rapid stream analysis is exercised in the operation, assuring maximum yields of high-purity phenol and acetone.

The new petrochemical plant was built by Canadian Kellogg Co., Ltd., affiliate of M. W. Kellogg Co., of New York.

V. G. Bartram, of Montreal, president of Shawinigan Chemicals, Ltd., is also president of B.A.-Shawinigan. Vice president and director of the new petrochemical company is M. S. Beringer, of Toronto, British American's board chairman. Other directors include H. T. O'Neill and R. O. Campbell, of British American, and R. S. Jane and P. W. Wright of Shawinigan. Roy E. Irwin is plant manager, assisted by R. H. Hall.

BOOK

THE GEOLOGY OF HENRYS CHAPEL QUADRANGLE, NORTHEASTERN CHEROKEE COUNTY, TEXAS. By H. B. Stenzel. Published by University of Texas, Bureau of Economic Geology, as Publication 5305. 118 pp. $3.50.

This geological report is the result of detailed field mapping by the author. Its purpose is to present a detailed geologic map and report covering the strata exposed in the area, elucidating their stratigraphic relationships, and giving information concerning useful geologic deposits. A geologic map in colors accompanies the report which also contains 57 text figures including many profiles and detailed sections of the Newby member of the Reklaw formation

GEOLOGY AND MINERAL DEPOSITS OF PRE-CAMBRIAN ROCKS OF THE VAN HORN AREA, TEXAS. By Philip B. King and Peter T. Flawn. Published by the Bureau of Economic Geology, University of Texas, Austin. 218 pp. and 29 pocketed plates.

This publication describes the geology of pre-Cambrian rocks exposed in the vicinity of Van Horn in the Trans-Pecos region of Texas. These rocks are described in six chapters, five by Flawn on smaller areas of exposure in the southern portion of the vicinity and one by King on the large northern area.

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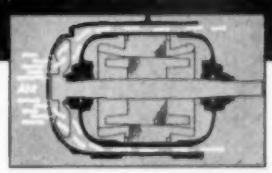

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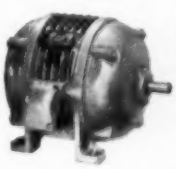

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How to Get Optimum Conversion

(Continued from page 105)

temperature fractional distillation analysis of a weekly composite sample of the fresh feed.

Catalyst life . . . With the daily conversion data obtained above and an accurate accounting of true polymer production, such as may be obtained from daily tank gages and subsequent correction for butane content based on vapor pressure correlations, the daily increase in catalyst life for each reactor may be determined as outlined below:

Let C_1 = per cent conversion of total feed in Bank 1
C_2 = per cent conversion of total feed in Bank 2
R = gallons per day true polymer produced by the unit

Then, the gallons of true polymer (R_2) made in 1 day by Bank 2 are calculated as follows:

$$R_2 = R\,[PC_2/(NC_1 + PC_2)]$$

Let C_D = conversion across Reactor D

Then, calculate gallons of true polymer (R_D) made in 1 day in Reactor D:

$$R_D = \frac{R_2\,C_D}{C_2}$$

Then, the increase in catalyst life of Reactor D for that day can be determined in gallons of true polymer per pound of catalyst by dividing R_D by the total pounds of catalyst in the reactor.

The gallons of polymer gasoline (R_E) made in 1 day in Reactor E is determined as follows:

Let C_E = conversion across Reactor E

Then:

$$R_E = R_2\,\frac{C_E\,(100 - C_D)}{100\,C_2}$$

The incremental gain in catalyst life for Reactor E for that day in gallons of true polymer per pound of catalyst is calculated by dividing R_E by the total weight of catalyst in the reactor.

The daily polymer production of Reactor F is calculated by difference:

$$R_F = R_2 - R_D - R_E$$

Using the value determined by R_F, the incremental catalyst life for Reactor F is calculated as for Reactors D and E above.

Optimum Catalyst Life

A definitive description of the calculations involved in determining the optimum catalyst life at which the charge in a reactor should be renewed is difficult to present, as the reactor arrangements of polymer units vary greatly and local plant conditions impose many different problems. In general, it may be said that the following items must be taken into consideration in such computations:

1. The value of a gallon of true polymer: This figure will invariably exceed the value of motor gasoline at the refinery as the polymer is a high octane blending agent and will also absorb and thus upgrade in value the quantity of butane or natural gas required to adjust its vapor pressure.

2. The values of unconverted butylenes and propylene at the refinery: These values will vary widely according to seasonal demands, the location of the refinery, and the general character of the refinery.

3. The loss of polymer-gasoline production as a function of catalyst life for a given reactor: In general, con-

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version will decline as the catalyst life increases. Each day that a reactor stays on stream represents an increasingly greater loss in polymer production as compared with operating with new catalyst.

4. The cost of a reactor turnaround: This item includes the cost of the catalyst, labor, materials such as reactor head gaskets, and, in some cases, such extras as carbon dioxide used to purge the reactor before unheading and before returning to service. In addition to these direct costs, consideration must be given to the loss of hydrocarbon vented from the reactor during shutdown, the net cost of lost polymer production while the reactor is idle, and the subsequent startup losses while the reactor is brought to operating conditions.

The value to the refiner of following the polymerization operation closely as detailed in this article and changing catalyst on the basis of careful consideration of the economic factors involved must be obvious. The net value to the refiner of true polymer after deducting the appropriate value of the converted butylene and propylene can be on the order of $6 per barrel.

Radioisotopes

(Continued from page 108)

Monsanto Chemical Co., Dayton: C-14 to study the mechanism of action of additives imparting desirable properties to lubricating oil.

Phillips Petroleum Co., Bartlesville, Okla.: C-14 to study the reaction of labeled 1-butene with synthesis gas in the Fischer-Tropsch reaction; to study the origin of catalyst deposit in a hydrogen-transfer reaction; to measure the rate of back reaction and adsorption rates in butane dehydrogenation; and to study dehydrogenation of methylcyclohexane; Co-60 for radioactive tracing of pipe-line scrapers.

Continental Oil Co., Ponca City, Okla.: Cl-36 to trace the presence and flow of salt waters in porous media.

Dowell Incorporated, Tulsa: B-82 and I-131 for control and evaluation of oil-well treatments.

Engineering Laboratories, Inc., Tulsa: Co-60 to measure the density of drilling muds by absorption of gamma rays.

S. S. Scherbatskoy Laboratories, Tulsa: Cd-115 to determine travel times in the circulatory system of oil wells.

Bird Electronic Well Survey, Bradford, Pa.: Co-60 to determine intake rates in water-intake wells in conjunction with water-flood projects.

Pennsylvania Grade Crude Oil Association, Bradford, Pa.: I-131 to study secondary methods of oil production.

Houdry Process Corp., Marcus Hook, Pa.; Zr-95 to study the cracking, polymerization, and isomerization of hydrocarbons with alumina-silica cracking catalysts.

Atlantic Refining Co., Philadelphia: Fe-59 and Co-60 to investigate lubricating properties of various engine oils; Ca-45, S-35 and As-76 to study the mechanism of washing with detergent and fatty acid soap.

Gulf Research & Development Co., Pittsburgh: Co-60 to determine rates of settling of additives in oil and estimate particle size distribution of agglomerates.

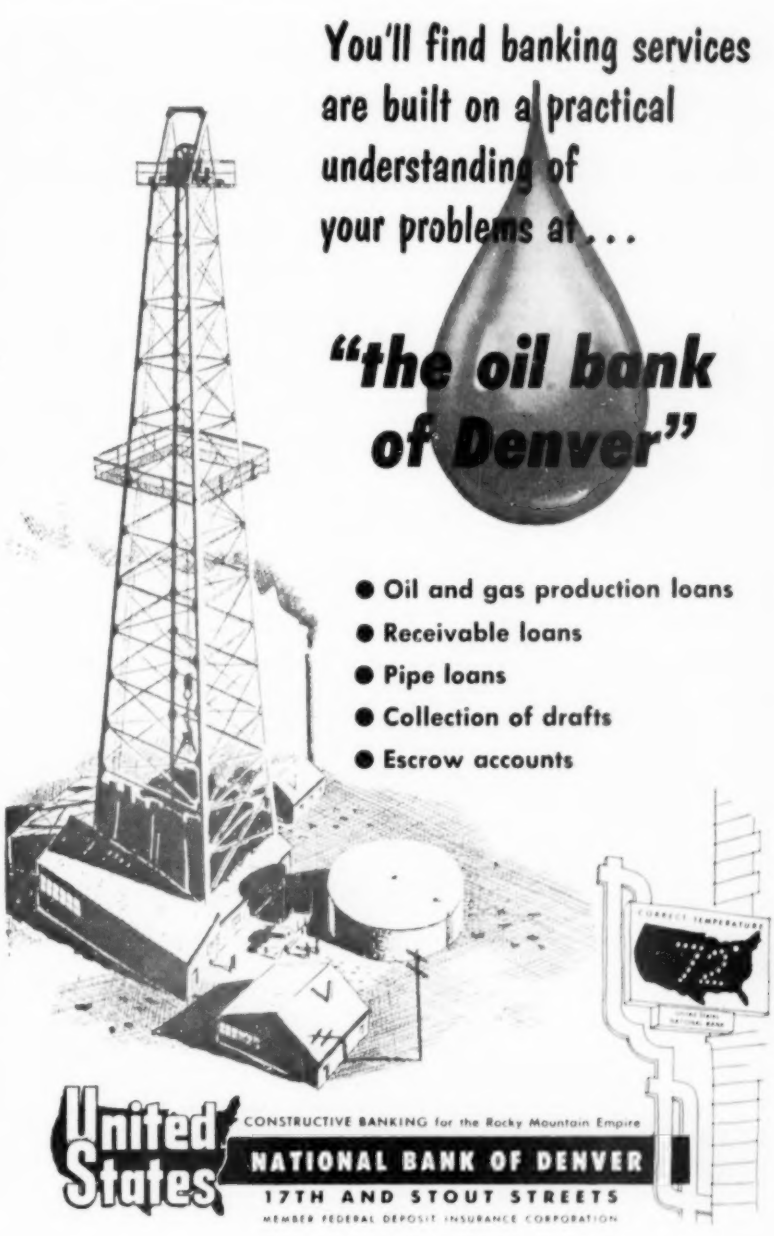
University of Texas, Austin: Fe-59, Ca-45, and Na-24 to evaluate methods for determination of iron, calcium, and sodium ash in petroleum.

The Texas Co., Bellaire, Tex.: Co-60 for measurement of metal wall thicknesses.

Magnolia Petroleum Co., Dallas: Co-60 and Sn-113 to study the flow of oil, gas, and water through porous media.

Shell Oil Co., Houston: Co-60 to measure densities of materials inside pressure vessels.

Illustrations courtesy of the Atomic Energy Commission.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Here's How to Conduct Oil Business in Louisiana

(Continued from page 103)

electric logs must also be filed, and complete set of cutting samples must be furnished when requested.

Completions . . . Order No. 29-B contains detailed rules for completion methods, specifying the size of casing and tubing, methods of cementing, use of blowout preventers, casing-head equipment, and other safety precautions. The department's agents are required to be given access to the mud records of any drilling well, and they have authority to require a change in the mud if necessary to insure proper control of the well.

Upon completion or recompletion of any well, the operator must file a "Well Completion Report" on Form SDM-1-R. This form also is used to obtain clearance for the movement of any oil produced during drill-stem or other production tests.

As previously mentioned, a special work permit must be secured, using Form MD-11-R, for any one of 14 operations which may become necessary. The district office must have at least 12 hours' notice before starting one of these operations in order that it may be observed by a commission agent or an offset operator. When the work is completed the operator or his service company must file a report on the appropriate form. These record forms are: MD-1, Plug and Abandon; MD-2, Acidize; MD-4, Perforate; MD-5, Perforate and Squeeze; MD-6, Plug Back; MD-7, Plug and Perforate; MD-8, Plug Back and Sidetrack; MD-9, Plug and Squeeze; MD-10, Pull Casing; MD-11, Sidetrack; MD-12, Squeeze Job; MD-13, Squeeze and Perforate.

Reports of deepening and workover operations must be made on Form SDM-1-R, the same form that is used for an original completion report.

Also in the "MD" series are four other reports which must be filed on every well as a matter of routine. These are: MD-15, Blowout Preventer Test Record; MD-16, Affidavit of Test of Casing in Well; MD-17, Drill-Stem Test Record; and MD-18, Deviation Record.

No well in Louisiana may deviate more than 3° from vertical, and the department may require a directional survey in case of controversy. When the operator desires to drill directionally, except for mechanical difficulties, such as to straighten the hole or sidetrack junk, a special permit must be obtained and the commission may adjust the well's allowable to conform to its location in the pay formation.

To abandon a well or pull casing the operator must not only file an application for a work permit but must also submit a detailed plan for abandonment. Order 29-B contains rules for mudding and cementing, and the operation must be witnessed by a department agent. The department may require posting bond to insure proper performance of the work.

Unusual methods . . . If an operator desires to use any unusual method of drilling, completing, or producing a well, he must file a special application giving all pertinent details, and the commission will hold a public hearing before granting a special exception.

The district office must be notified immediately on completion or recompletion of a well, and within 5 days a potential and gas-oil-ratio test must be made by the operator and witnessed by a department agent. An initial potential report must be filed by the operator on Form SDM-2. The department then assigns the well a daily allowable, using Form MD-19-A, "Authority to Produce." This is effective for the remainder of the current month, after which the well takes its place in the regular monthly allowables schedule for that field.

Each month the operator must file with the district office a "Monthly

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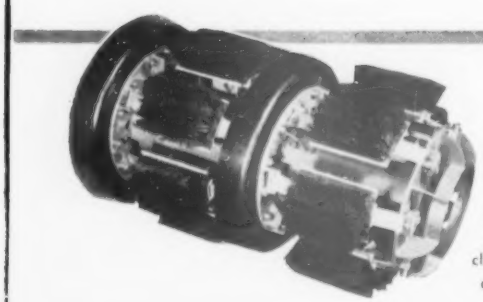

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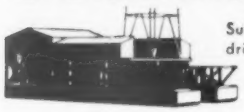
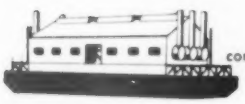


Submersible drilling barges

Tugs



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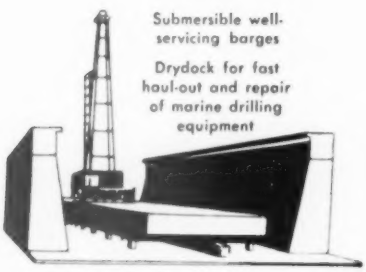

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Well Potential Report" on Form DM-1-R using a separate sheet for each field. This report gives such data as gas-oil ratio, choke size, tubing pressure, and b.s. and w.

The department may require bottom-hole-pressure tests when it considers these data essential in setting allowables and regulating conservation.

Whenever a well goes off production for any reason other than ordinary maintenance operations a report must be made to the district office immediately. The department then issues a "Cancellation of Allowable" on Form MD-19-R.

It can be seen that the wealth of detail on this long series of reports gives the Department of Conservation a complete statistical file on the history, performance, and condition of every well in the state. The system also enables the department to have an engineer present at every important operation during drilling and completion or reworking to enforce its regulations as to safety, reservoir protection, and production control.

The department's Order No. 29-B includes detailed regulations on lease equipment, testing methods, and operating practices, all of which are pretty much standard operating procedure in all oil regions.

Once a well is completed and placed on production, the operator must turn his attention to keeping the records required by the "R Series" report forms. These reports enable the department to keep track of the production, transportation, and disposition of every barrel of crude oil and liquid products and every cubic foot of natural gas produced in the state, thus giving it a check on compliance with its proration orders. Any oil or gas produced in excess of allowables or in violation of commission orders is designated as "illegal," and there are severe penalties for handling illegal material.

Before any oil can be moved off a lease, the producer must file Form R-4 Revised, "Producer's Certificate of Compliance and Authorization to Transport Oil from Lease." This must be made out in quadruplicate, notarized, and sent to the Baton Rouge headquarters. This certifies that the operator has complied with all conservation laws and orders, and designates transporters who are authorized to remove stated percentages of the allowable production from the lease. A separate form must be filed for each lease, and a new form must be filed whenever the lease changes ownership or transporters are changed. When approved by the department, one copy of Form R-4 is returned to the producer and one is sent to the transporter and becomes his authorization to remove the oil.

By the fifteenth of every month the producer must file Form R-1 Revised, "Monthly Producer's Crude Oil and/or Condensate Report," which shows the production, movement, and stocks of oil on each lease. A separate form must be used for each field or pool. Three copies must be made, one for the department at Baton Rouge, one for the district office, and one for the transporter.

Moving product . . . Whenever any liquid product is moved from a lease, whether by pipe line, barge, or other means, the transporter must file Form R-2, "Monthly Transporters and Storers Report." This report consists of four sections, and is a detailed record of the quantity taken from each lease and producer, amounts obtained from other sources, to whom deliveries were made, and quantities in storage in each tank at the end of the month.

If the oil leaves the state, of course the department no longer has control over it, but if it is refined in Louisiana, the statistical record continues by means of Form R-3, "Refiner's Monthly Report." This is an extremely detailed report, and gives a record of the quantity and source of all receipts by type of liquid, deliveries to others, stocks on hand, runs to stills, products

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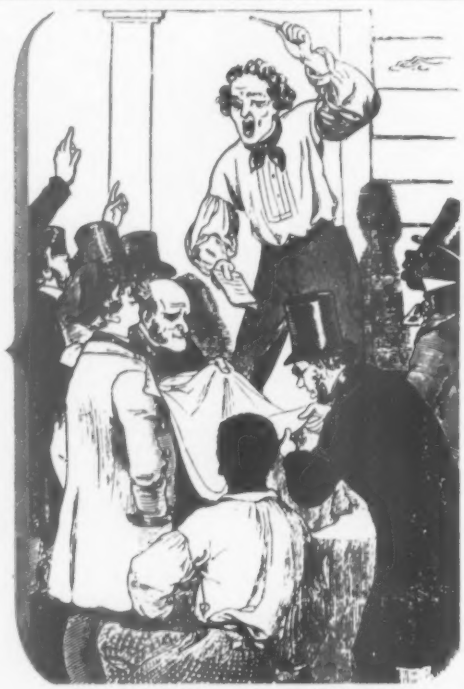

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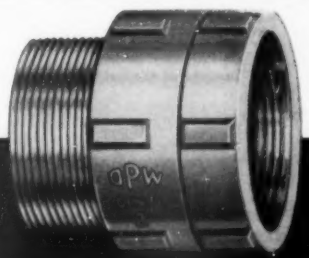

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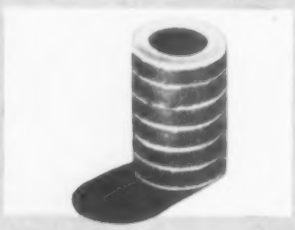

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manufactured, and plant use and losses.

A similar procedure is used to keep track of natural gas. Producers must file Form R-6-P, "Monthly Producer's Natural Gas Report," which shows production by wells and zones, volumes vented and used in lease operation, gas delivered to and returned from processing plant, and sales to pipe lines.

In like manner gas pipe lines must file Form R-5-T, "Monthly Transporter's Natural Gas Report," giving full details of its operations and accounting for all gas.

Gasoline and cycling . . . The final link in the chain of statistical control is provided by Form R-6, "Monthly Gasoline and/or Cycling Plant Report." This shows in detail the amount of gas taken from each well, the disposition of the residue gas, and the plant production, receipts, deliveries, and stock of each product.

As each new well is placed in production it is assigned a specific daily base allowable, which is the maximum it may produce in any 24-hour period. However, if a well's gas-oil ratio exceeds 2,000 cu. ft. per barrel, its maximum production is limited to the quantity determined by multiplying the base allowable by the base gas-oil ratio (2,000 to 1) and dividing by the gas-oil ratio of that well. Exceptions are granted where the gas is utilized and for other special circumstances.

Regardless of a well's base allowable, the total amount of production of crude oil in Louisiana is set by state-wide orders, usually issued every month; hearings on allowables are usually held every 2 months. The total allowable is divided among fields and pools by a complicated formula. Stripper fields are generally not prorated, and many fields are governed by special schedules.

For flush fields the state-wide proration order assigns maximum output schedules for each company, lease, and pool.

The Louisiana department has authority to consider market demand as an element in setting allowables to prevent waste, as is true in a number of other states, but its method of adjusting well allowables to total state output is unique in that it uses depth brackets. It has tables of maximum daily allowables by depth of producing zone, and the department raises or lowers the figure for various depth brackets each time a change is ordered in the state's total output. These schedules permit deeper wells to produce relatively larger quantities than shallower wells, in keeping with the increased costs and higher reservoir pressures generally encountered.

In addition to the state-wide orders

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Ladish measures the spectrum to verify chemical composition

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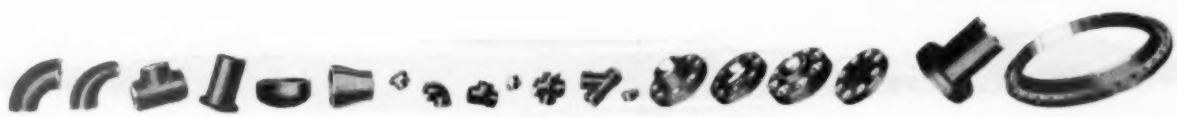

Another new development using

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B. F. Goodrich Chemical Co. supplies the Hycar rubber only.

Why this HYCAR hydraulic hose has a long and useful life

YOU can see in this picture some of the tough conditions this hydraulic hose, made with Hycar rubber, has to meet—and *does,* to perfection!

One of them is oil, particularly high-pressure lubricants. Another is grease, including compounded greases carrying metallic soaps. Still another is corrosion from battery acid. There are the deteriorating effects of gasoline, plus abrasion from rough handling or dragging around to contend with. And the Hycar hose must remain flexible.

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and regulations and the uniform reporting system, the Department of Conservation has broad powers to prevent waste, protect correlative rights, and otherwise control oil and gas operation in Louisiana, and it applies such powers through special orders, applicable to a single field or condition. Except for temporary orders to cope with an emergency, no order can be issued except after a hearing with 10 day's prior notice to interested parties.

Act 157 of 1940 is considered broad enough to include the exercise of any act which past experience has proved is required in the accomplishment of the purpose of conservation. For example, the department has many rules for the prevention of fire and accident, and the protection of freshwater sands.

The drilling of unnecessary wells is considered waste under the law, and this gives the department authority to determine the spacing of wells and to establish compulsory unitization of surface interests within a drilling unit.

Voluntary pool-wide unitization agreements are authorized and encouraged, and the department has power to require pool-wide unitization in any pool which requires recycling, repressuring, or extraction of natural gasoline.

Carbon black . . . No carbon-black plant may be built without authority from the department, and permits to produce carbon black are issued only to prevent the waste of gas.

In a general discussion of the powers and functioning of the Louisiana Department of Conservation, printed in the University of Tulane Law Review for December, 1949, former Commissioner S. L. Digby said:

"Act 157 of 1940 of the Louisiana Legislature, known as the Oil and Gas Conservation Law of Louisiana, contains the policy of the state relative to conservation, and in addition to being comprehensive, it is considered to be protective of the correlative rights of both landowners and owners of mineral rights. A study of the act and an understanding of its practical application will undoubtedly dispel any belief of its unwieldly or cumbersome character; contrarily, it has been proved to be workable, efficient, and protective of the rights of all. . .

"With the enactment of Act 157 of 1940, came the necessary mechanics to put into effect a real conservation program which would require the introduction of sound engineering and geological principles into the task of conservation. Since the enactment of Act 157, great strides have been made in the direction of true conservation of Louisiana's oil and gas resources."

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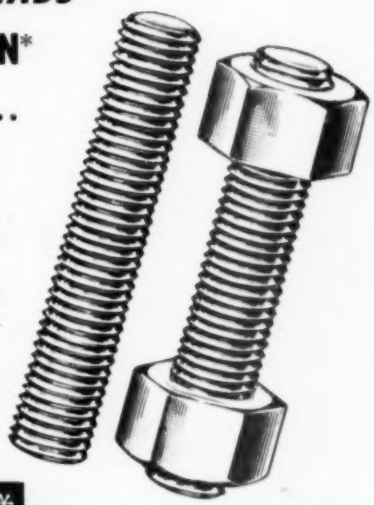

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- Threads *centerless-ground* to provide smooth finish unobtainable with most other production methods.
- Finish of KILBOURN ground threads greatly reduces seizing during assembly or disassembly.
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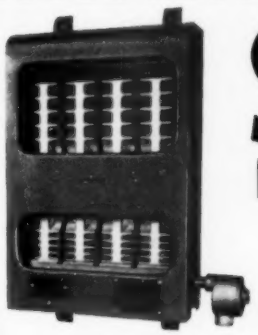

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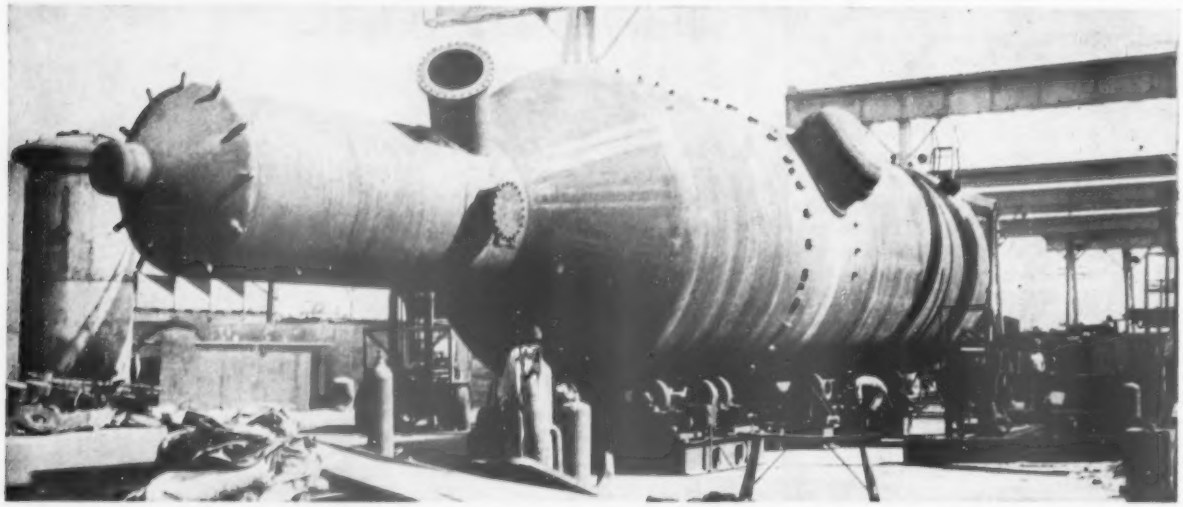


REACTOR . . . This vessel, over 74 ft. in over-all length by 13 ft. i.d. and weighing 62 tons, is shown at fabricating plant in Los Angeles area.

King-size moving job on the West Coast

Refinery vessels posed complex problems

REGENERATOR . . . Movement of the vessels to Long Beach Harbor was on low-bed trailers. The regenerator shown here is over 62 ft. long by 19 ft. 8 in. i.d. and weighs 50 tons.

WHEN the vessels are as big as the regenerator and reactor shown in these photos the problem of moving them can become quite complex. These vessels are part of the Orthoflow cat cracker now being constructed by Bechtel Corp. for Imperial Oil Co.'s new refinery near Vancouver, B. C.

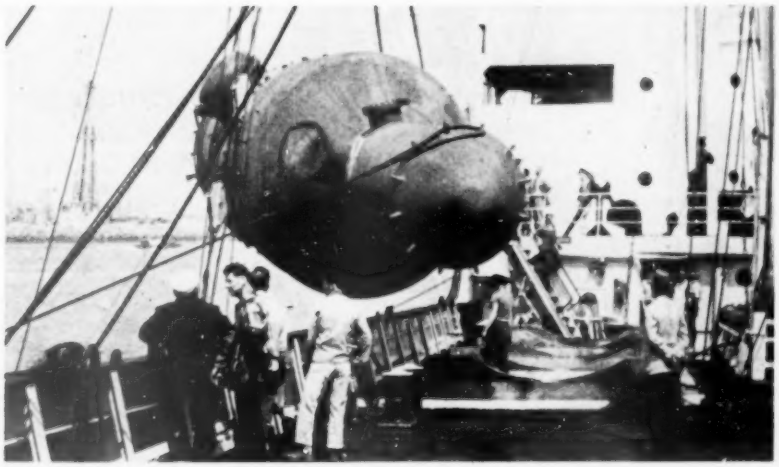
The reactor is over 74 ft. in over-all length by 13 ft. i.d. and weighs 62 tons. The regenerator is over 62 ft. long by 19 ft. 8 in. i.d. and weighs 50 tons. The problem was to deliver these units from Southwestern Engineering Co.'s fabricating plant in the Los Angeles area to the jobsite.

First step was to get the vessels from the Vernon industrial area to Long Beach Harbor for loading aboard ship. The vessels were placed on low-bed trucks, one of which employed 40 tires. Although the most direct practical route was chosen, twelve turns were still required, each one being a problem in itself.

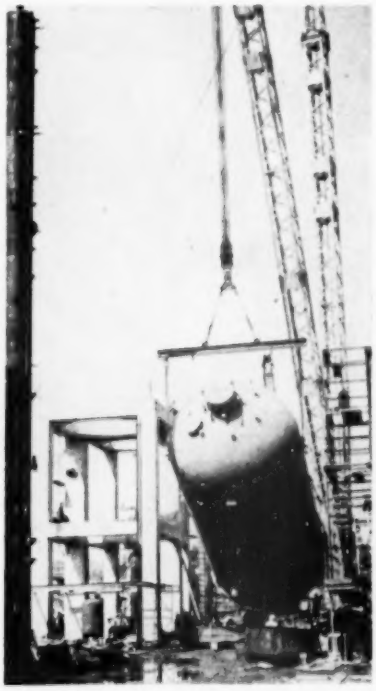
The loads measured slightly over 25 ft. at the high point, which meant that most overhead wires in the area traversed had to be removed. The loads passed through seven towns and the trip was completed in 6½ hours. This was accomplished through the very close cooperation of a large crew of men, including employes of the telephone and utilities companies and the state highway department.

The next step was to get the vessels aboard the ship. They were moved into the harbor by barge. A major rigging job, requiring a total of 7 hours was then involved in getting the vessels aboard. It was noted that this load was one of the biggest from the standpoint of bulk ever handled at Long Beach harbor.

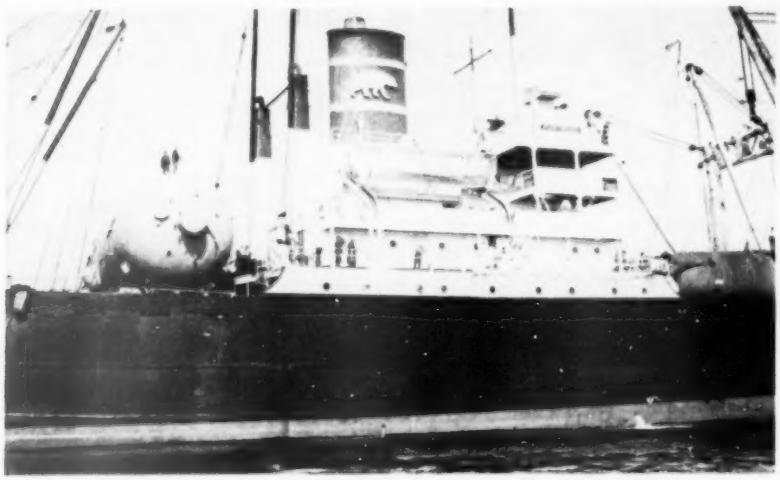
On arrival at Vancouver harbor the vessels were barged to a marine terminal near the refinery and moved uphill to jobsite. This last leg of the trip took 13 hours and was the most difficult of all since it was over grades varying from 12 to 15 per cent.



COMING ABOARD . . . Here the reactor is being lowered into a special cradle on the deck of the ship. This major rigging job required about 7 hours.



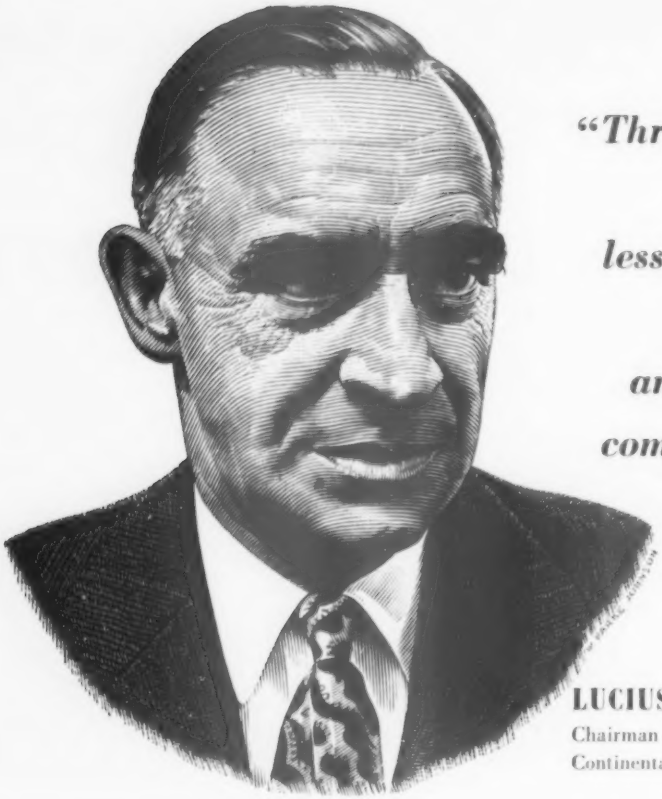
RIGGING UP . . . Bechtel Corp. guide derricks, 160 ft. high with 48-in. square sections, capable of handling 100-ton loads, are doing the job here.



BIG LOAD . . . Relatively large size of vessels is evident here.

MOVING TO JOBSITE . . . Regenerator is being moved to Imperial Oil Co., Ltd., refinery site near Vancouver, B. C. This last leg of the trip was all upgrade and took 13 hours.

IN PLACE . . . Reactor, delivered on schedule, is now in place as new cat cracking unit begins to take shape.



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THE OIL AND GAS JOURNAL
TULSA 1, OKLAHOMA

PRECOOLING ENGINE COMBUSTION AIR—1

How to Condition Combustion Air

by W. R. Crooks*

BY "combustion air conditioning" is meant the preparation of the air entering the cylinder in the best condition to promote orderly combustion. Cooling does the following:

1. Increases the density, making more oxygen available for combustion.

2. Cools the internal surface of the cylinder, which is especially significant for two-cycle and for four-cycle supercharged engines, since cool air is flushed through the cylinder.

3. Reduces the final compression temperature.

Humidifying the air tends to aid combustion by causing a more orderly flame propagation, thus reducing combustion noise. A combustion air-conditioning system both cools and humidifies the air.

Water Cooling

Several methods of cooling air may be employed. Evaporative water cooling, which makes use of latent heat of vaporization, is a simple and inexpensive means not only of cooling air but also of raising the relative humidity.

Analysis of wet-bulb temperatures on the Gulf Coast shows that wet-bulb temperature does not exceed 84° F. This means that an evaporative cooler can cool air to 90° F. anywhere in the United States. Standard rating temperatures for diesel engines are based on 90° F. (Diesel Engine Manufacturers Association).

The following results can be expected with a water-cooling system when cooling to within 5° F. of the initial wet-bulb temperature:

TABLE 1—EFFECT OF AIR CONDITIONING

	Semiarid conditions	Gulf Coast conditions
Initial conditions	*115° F.	*100° F.
	†65° F.	†84° F.
	‡2%	‡50%
Combustion air to engines	*70° F.	*89° F.
	‡75%	‡70%

*Dry bulb. †Wet bulb. ‡Relative humidity.

How it can be done . . . An effective, simple, and complete combustion air-conditioning system consists of an evaporative cooler and humidifying unit which is interposed in the air inlet piping to the scavenging blower. The unit is equipped with a small water pump which sprays water into the evaporative cooler through fog nozzles at the rate of 50 to 100 g.p.m. Total consumption of water under average conditions is approximately 0.3 lb. per hp.-hr.

The evaporative cooler is capable of reducing the incoming air temperature to within 7° F. of prevailing wet-bulb temperature. The aftercooler on the blower discharge is sized to lower the air temperature to within 15° F. of the cooling-medium temperature which is a variable depending on prevailing conditions. This system is covered by Cooper-Bessemer Corp. patent. An engine operating under semiarid summer conditions of 115° F. dry bulb and 65° F. wet bulb at 3,000-ft. altitude would normally have the air supplied to the engine at 153° F. dry bulb and a relative humidity of approximately 1 per cent. With conditioning equipment combustion air can be supplied to the engine at 87° F. dry bulb and 40 per cent relative humidity.

Compressor engines in operation and current production did not have sufficient room to use the system mentioned above. The system finally used was to place the evaporative cooler and humidifier between the scavenging compressor and the engine. An analysis, using semiarid initial conditions as in Table 1, led to the result that relative humidity of air to the engine would be 75 per cent.

Actual field tests, starting with ambient air temperature of 103° F. and wet bulb of 71° F. showed that with conditioning air temperature to cylinder was 102° F. and relative humidity was 75 per cent.

Further gains . . . The air can be brought through the compressor and a combined aftercooler-evaporative cooler and supplied to the air inlet manifold (Fig. 1). With initial conditions of 115° F. dry bulb and 65° F. wet bulb air can be supplied to the engine at 66° F. dry bulb and 66 per cent relative humidity.

It is of advantage to supply gas engines, in particular, with air that is as near saturation as possible. Effect of humidity is primarily suppression of detonation, more orderly flame propagation, and a lower mean temperature within the combustion chamber. High humidity also enables advance in ignition timing, lowering cylinder and exhaust temperatures even more.

The same basic principle is also in current use on four-cycle supercharged gas, gas-diesel, and diesel engines.

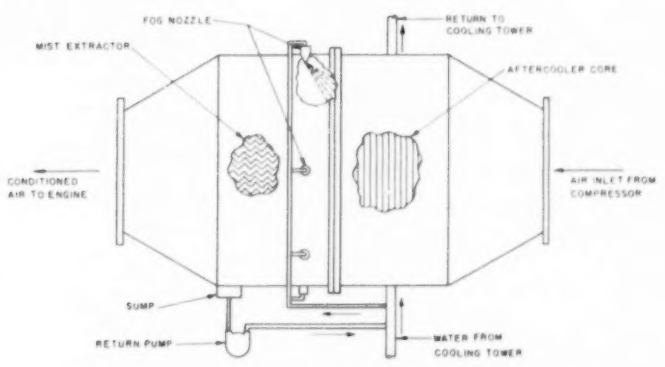


Fig. 1—Combined evaporative and shell air tube aftercooler.

*Cooper-Bessemer Corp., Mt. Vernon, Ohio. Portion of paper presented at N.G.A.A. regional meeting, 1953.

F. H. (Ham) Isaacks, Cameron Division Sales Manager in the New Iberia, Louisiana, District

WEEKS ISLAND IS STRONG FOR LIFT-PLUG VALVES

The extremely deep, high-pressure fields of South Louisiana have proven again the superiority of Cameron Non-Lubricated Lift-Plug Valves. In Weeks Island, South Lewisburg, and surrounding fields, extensive use is made of Cameron Lift-Plug Valves in Christmas tree manifolds as well as gathering and separator systems. They require no lubrication maintenance — they are easy to repair without removal from the line — they seal tightly and operate easily under full rated pressures. Obviously a continuous saving in man-hours and money is the result.

Try these great valves in your operations and see why **Weeks Island Is Strong For Lift-Plug Valves!**

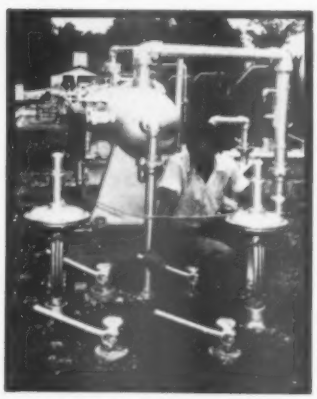
CAMERON IRON WORKS, INCORPORATED

P. O. BOX 1212 HOUSTON, TEXAS

Export Office: 7912 Empire State Bldg., New York City

Lift-Plug Valves in a natural gasoline plant in the South Lewisburg field.

One of hundreds of high-pressure Christmas tree manifolds in Southern Louisiana fields utilizing Cameron Lift-Plug Valves.



Partially buried Lift-Plug Valves on a high-pressure manifold, attest to the trouble-free service provided by these fine valves.

Cameron

NON-LUBRICATED

LIFT-PLUG VALVES

by W. L. Nelson
Technical Editor

Alphabetical List of Some of the More Common Refinery Alloys and Steels

Part 1

(A similar listing, alphabetized according to service or equipment will be published later)

Material—	Outstanding service	Chemical composition, per cent§									
		Cr	Mn	Cu	Zn	Sn	Al	Mg	Si	Sb	Others
Admiralty metal	Water-cooled condensers and coolers*	....	....	71.0	28.0	1.0					
Alclad	Brackish water condenser and cooler tubes	(1 per cent zinc aluminum alloy integrally bonded to 13 per cent Mn-Al alloy)									
Aluminum alloys:											
2S hardenable	Instrument tubing and	....	....	....	....	....	‡99.0				
3S	cooler tubing	....	1.2	†0.2			‡97.0				
52S		0.25		†0.7			‡96.0	2.6			
14S heat treatable	Bubble caps, furfural	....	0.8	4.5			‡92.0	0.5	0.9		
17S	exchangers, hydrogen	....	0.7	4.0			‡92.0	0.5			
24S	sulfide gases or solu-	....	0.6	4.1			‡92.0	1.5			
25S	tions, methyl ethyl	....	0.8	4.5			‡92.0	†0.02	0.9		
A51S	ketone, MEA and	0.25	†0.02	†0.3			‡96.5	0.6	0.9		
53S	DEA solutions, stor-	0.25		†0.05			‡96.0	1.2	0.7		
61S	age-tank roofs, etc.	0.35					‡98.0	1.0	0.6		
75S		0.27	0.2	1.6	5.6			2.5	†0.5		
13 castings	Bubble caps, furfural						rest		12.0		
43	exchangers, hydrogen						rest		5.0		
85	sulfide gases or solu-			4.0			rest		5.0		
122	tions, methyl ethyl			10.0			rest	0.2			1.2 Fe
A132	ketone, MEA and			0.8			rest	1.0	12.0		0.8 Fe, 2.5 Ni
142	DEA solutions, stor-			4.0			rest	1.2			2.0 Ni
195	age-tank roofs, etc.			4.0			rest				
B195				4.5			rest		2.8		
214							rest	3.75			
A214					2.0		rest	3.75			
220							rest	10.0			
355				1.25			rest	0.5	5.0		
356							rest	0.3	7.0		
Aluminum brass	Sea or bay water chlorides			76.0	22.0		2.0				
Aluminum bronze	Nonsparking tools, salt-water corrosion			90.0			10.0				
Antimonial admiralty	Resistant to dezincification			72.0	27.0	1.0				0.5	
Beryllium copper	Nonsparking tools	(0.5-2.5 Beryllium, rest mainly copper)									
Brasses—(Some available as clad plate or tubes):											
Aluminum	Sea or bay water			76.0	22.0		2.0				
Admiralty	Water-cooled condensers and coolers*	....		71.0	28.0	1.0					
Antimonial admiralty	Resists dezincification	....		72.0	27.0	1.0				0.5	
Muntz metal	Exchanger tube sheets*			60.0	40.0						
Red	Alkaline spray pond or cooling tower water			85.0	15.0						
Silicon manganese	Bolts, nuts, screws or rods of submerged condensers or cooling towers	....	1.0	96.0		1.0					
Yellow or common	Exchanger baffle or turbulence plates	....	....	65.0	35.0	....	....	....	....	....	....
Carbon (Karbate)		(Substantially pure compressed carbon)									
Cast iron	Pump bodies, soil and water pipe, low temperature tube supports, etc.	....	0.8	....	....	....	....	....	1.5-2.0	....	3.0 C
Castings—(See steels or specific alloys)											

*Resistance to dezincification improved if inhibited with arsenic (0.02-0.2 per cent) or antimony. †Maximum. ‡Minimum. §A blank does not necessarily mean zero or absent—it may mean that information is not available. The meanings of the symbols are Fe, iron; C, carbon; Cr, chromium; Ni, nickel; Mo, molybdenum; Mn, manganese; Cu, copper; Zn, zinc; Sn, tin; Al, aluminum; Mg, magnesium; W, tungsten; Si, silicon; Sb, antimony; Va, vanadium; Ti, titanium; Pb, lead; Ag, silver; and Cb, columbium.

Use and Care of Wire Rope—15*

One rope supporting a load is referred to as a single-part line and the tension in the rope is equal to the suspended weight. By passing the rope under a sheave at the load the tension is reduced to approximately one-half the suspended weight and it is then referred to as a two-part line. For every additional sheave or change in the attachment of the dead end that adds another part of rope leading from the load, the tensions are further reduced and the reeving is referred to as three, four, five, etc. part line (See accompanying figure).

The tension in the lead line to the source of power is always the greatest. The tension decreases towards the dead end by the increments of traction. The object of multiple reeving is to allow one to use a relatively small-diameter rope to lift a heavy load. Where three or more sheaves are used in the upper set the hoisting rope should lead to the drum from one of the central sheaves to keep the block from tilting and prevent rubbing of the rope against the sheave flanges with resulting injury to the rope.

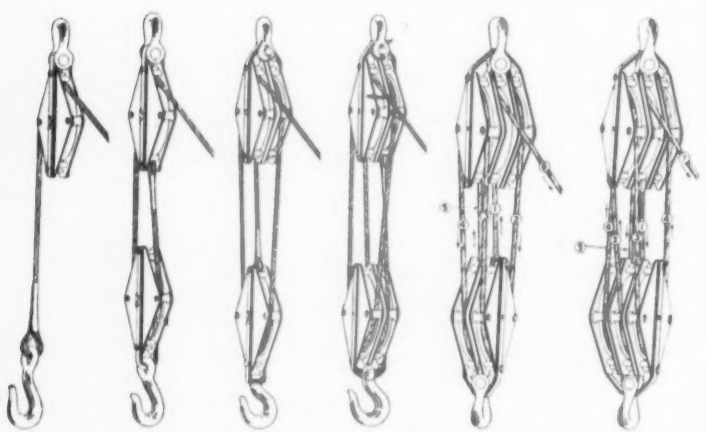
The efficiency of such reevings decreases as the number of parts is increased. Factors used to determine the efficiencies and the load line tensions are given in the table below. The total load to be lifted is multiplied by these factors.

*Taken from Bulletin 61, Use and Care of Wire Rope, A. Leschen & Sons Rope Co.

Number of Parts "N"	2	3	4	5	6	7	8	9	10	11	12
Efficiency "E" %	96.15	92.45	88.89	85.48	82.19	79.03	75.99	73.07	70.26	67.57	64.95
Lead line pull factor "F"	.5200	.3605	.2812	.2339	.2027	.1808	.1645	.1521	.1423	.1345	.1283

$$\text{"E" for "N" Parts} = \frac{1}{(1.04)^{(n-1)}} \qquad F = \frac{1}{N \times E}$$

Lead line pull = weight lifted × "F"



1 Part Line 2 Part Line 3 Part Line 4 Part Line 5 Part Line 6 Part Line

Check and Double Check†

Safety is a continuing thing. It is not a one-shot business. It means that a man must remain ever alert, ever conscious of danger spots. It means that he must always be checking. Here are some check points for any supervisor. We'll guarantee that using these points he'll find something that needs taking care of.

†Courtesy of A.A.O.D.C.

1. Checking physical hazards:

a. Check all hand tools at work benches, in tool chests, and on trucks to see if there are any spread wrenches, loose hammer handles, mushroomed chisels, etc.

b. Check on housekeeping practices to see if there is any loose material or equipment lying around where a person might stumble over it.

c. Check for fire hazards to see whether there is any unnecessary accumulation of rubbish, and whether oily rags and inflammable material are kept on the premises.

d. Check stairs and runways to see that there are no defective boards and no loose objects on the steps and landings.

e. Check all overhead platforms to see that hand tools or other objects are not left in hazardous positions.

2. Checking on unsafe practices:

a. Note the position men stand in when handling material and whether the load is too great for the number of men handling it.

b. In using hand tools, observe whether they are being used in the right manner.

c. On chipping, grinding, cutting, or other work where an eye hazard exists, observe whether goggles are worn at all times and if such goggles are of the proper type.

d. Observe whether practical jokes are being indulged in on the job.

e. Observe driving habits and see whether the driver takes chances in pulling in and out of traffic, whether he drives too fast for conditions that exist, if he gives proper hand signals, and whether he recognizes the rights of other drivers.

It is well to remember while making observations that the whole idea is to prevent injuries. Criticism for the sake of criticizing has no place in the prevention of accidents. Accident prevention necessitates a cooperative movement, and only by developing such an attitude can we get results.

INSTRUMENTS

What Is Involved in Pipe-Line Control-Valve Application?

by C. F. Woods*

FOR a pipe-line system, under ideal conditions, the line is at maximum capacity, all pumping loads are evenly distributed, and with the suction pressure above control point and the discharge pressure below control point, the valve is wide open.

When the conditions of the pipe-line system are not ideal, then the control system has to go to work. When pumping-rate changes are required, the control system is called upon to throttle the valve so that fairly equal pumping rates are maintained at each station on the line. Normally such changes are not of great magnitude. Most important, however, the control system also functions to handle major upsets of an emergency nature.

Valve requirements . . . The control instrument, therefore, must position the valve for many different operating demands and load changes. Because there may be a demand to go from "no control" to "control" in a few seconds, the requirements for such valves differ greatly from those on conventional process control applications wherein a control valve is continuously throttling. A satisfactory pipe-line control valve must answer two requirements: (1) have a minimum pressure drop in the open position, and (2) respond smoothly to all control demands, both major and minor.

Valve designs largely in use today represent a compromise, by giving preference to control response at the sacrifice of minimizing the open pressure drop. Valve designs in current use include double-seated plugs, both V-port and contoured disks, with either "linear" or "equal percentage" characteristics which may be plotted on the familiar per cent flow versus per cent lift plot, at constant pressure drop.

Equal percentage plug . . . This offers fast recovery from "no control" in open position to "control range" at 70 per cent lift or thereabouts. On control, it gives satisfactory response. However, its pressure drop, in the open position, is larger than for a linear plug of the same pipe size. Another is that the severe slope and length of its plug walls may permit larger frictional and "drag" effects thus leading to unbalance. Also, erosion can be more severe, and in a V-port there is more likelihood of catching solids.

Linear plug . . . This has a lower pressure drop in the open position (about one-third less than the percentage type). Because of the slope of the contours, turbulence is at a lower level, the unbalanced stem forces, including torque, are lower and less power is required to operate it. It has to move into its control range at around 35 per cent lift and thereby is slower in recovery.

In designs previously available, the linear plug has been considered objectionable partly because of inadequate speed of response and partly because of the apparent control effect of its inherently linear characteristic curve. Actually, this curve is not strictly linear, except in the central portion.

Further comparison . . . On practically all "characteristic" curves the "flow" or "capacity" of "Cy" value is shown as a percentage figure. Now, actually, the linear plug has 20 per cent greater capacity than the same nominal size equal percentage plug. Looking at them, then, in a true comparison (Fig. 1), one can note the ratio of capacities and have a clearer idea of the slopes of their curves **in the control band.**

If we displace the entire linear curve as in Fig. 2, we see how **nearly parallel** they are. Both the 4.2 per cent and 5.2 per cent equal percentage plugs are shown. The latter was developed to provide special flow characteristics which have been held desirable on pipe-line applications, and is in itself a further compromise. It has a smaller capacity and larger pressure drop than the 4.2 per cent plug.

*Minneapolis-Honeywell Regulator Co., Dallas. Portion of paper presented at A.S.M.E. Kansas City meeting.

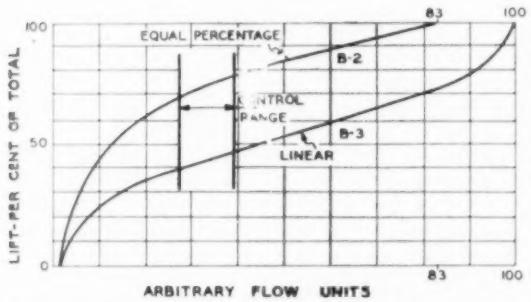


Fig. 1—Inherent characteristic curves of equal percentage and linear plugs are compared.

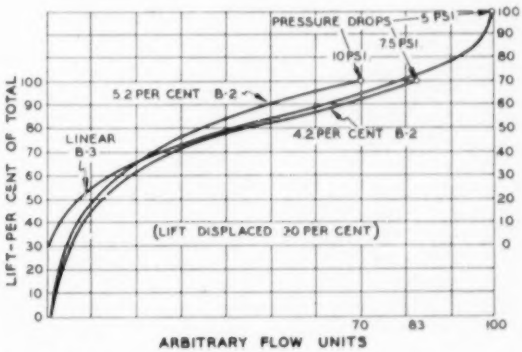
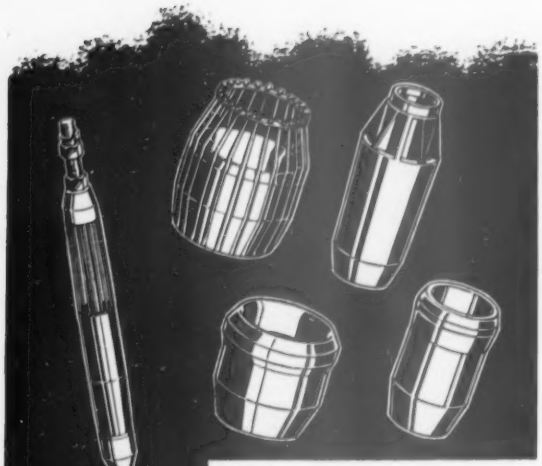


Fig. 2—Further comparison is made with entire linear curve displaced upward to show how nearly parallel the curves are.

Do you have a Swabbing Problem?



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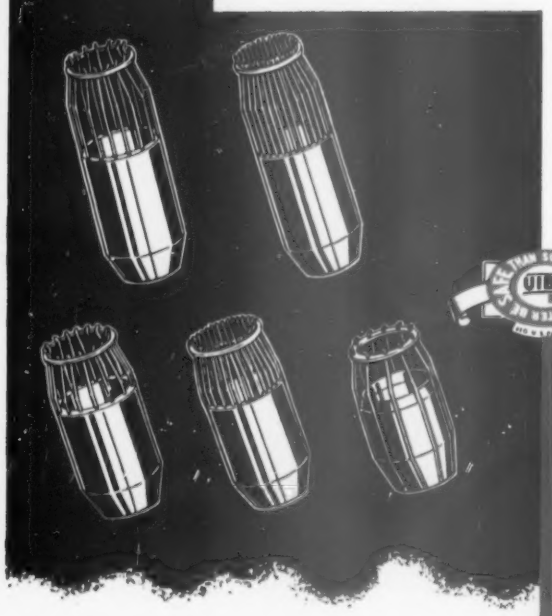

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ELECTRIC LOGGING—10

Electrode Spacing Vs. Bed Thickness

by R. I. Martin*

BOTH the experimental and computed curves introduced in Installment 9 were obtained subject to the following conditions:

1. The sand and shale are homogeneous and isotropic.
2. The sand is not invaded by the mud.
3. The line of the electrodes is perpendicular to the sand-clay contacts.

The first condition is never met in the field, but small changes will not modify the results too much.

In the second case, if the electrode spacing is large enough in comparison with the depth of mud invasion the results will not be too different.

Calculations show that the effects of dip of the formation are negligible when the dip angle is less than 30°. Up to 45° the influence is relatively small. Large divergences occur only when the dip is greater than 60° and when the beds are thin. In practice the influence of dip may be neglected.

For convenience, beds whose thickness is greater than the electrode spacing will be known as thick beds, while those whose thickness is less will be designated as thin beds.

See Installment 9 for the six lettered figures to which reference is made in the following paragraphs:

Fig. A shows a thick bed whose thickness is eight times the electrode spacing. The top and bottom contacts are defined clearly although they are not located opposite the actual contacts. The top boundary is logged too low and the lower one too high.

The difference is the same in each case and is equal to one-half the electrode spacing. Therefore the apparent thickness is less than the true thickness by an amount which is equal to the electrode spacing used. This difference is not important on thick beds but may become appreciable when a series of thin sands is considered.

In practice, although the shape of the curves is more rounded than shown here the points corresponding to the upper and lower boundaries of the bed may still be recognized. They are the points of inflection. That is, the points where the curvature of the peaks change direction. Usually there is no difficulty in identifying these points of inflection, unless of course the contact itself is complex.

The apparent resistivity R_A recorded is less than the true resistivity R_T.

Figs. B and C show beds four times as thick and two times as thick as the electrode spacing. The upper and lower boundaries are still clearly defined but the apparent resistivity decreases.

Fig. D shows a bed whose thickness as 1.33 times the electrode spacing. The diagram is different from the preceding ones.

Fig. E shows a bed whose thickness is equal to the electrode spacing. Here the resistivity opposite the center of the bed is lower than that of the surrounding shales. It should not be confused with a water sand of resistivity equal to, or less than that of the shale, because of the resistivity humps above and below the low center. In the first case, if there is no change in resistivity there will be no changes in the log. In the second case when the resistivity of the water sand is lower than that of the shale, the depression will be broader by an amount equal to the electrode spacing.

Fig. F shows a case where the thickness of the bed is one-third of the electrode spacing. Here the depression is flat bottomed and shows a slightly higher resistivity than the preceding case.

Fig. 1 shows in a qualitative way why these low resistivities are found. In this case the resistant bed exerts a screening effect on the pickup or potential measuring electrode M. The potential recorded and hence the resistivity are therefore abnormally low.

This discussion of beds whose thickness is equal to or less than the electrode spacing may not appear pertinent when the 16-in. normal is considered. However, the Schlumberger long normal is also a two-electrode device which has a spacing of 64 in., on the average. Beds 5 ft. thick are of interest, so that the behavior or the normal device should be understood.

The reason for taking a second log with a wider spacing is to reduce the effects of both the bore hole and invasion of mud filtrate into the sand. Frequently the resistivity recorded by the long normal is close to the true resistivity of the sands. This better determination of resistivity is obtained at the expense of clear definition of lithological changes when the sands are thin and closely spaced.

Under such conditions the short normal will often identify individual sands. The apparent resistivity of the sands is lower and the apparent resistivity of the shales is higher but the individual layers may frequently be recognized.

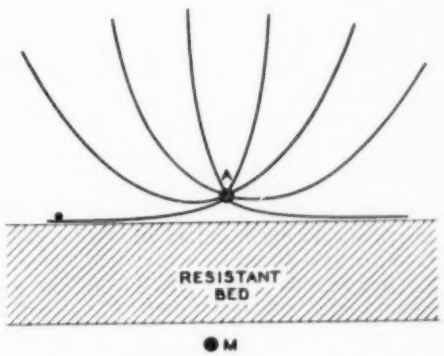


Fig. 1—Current flow near a thin resistant bed.

*Assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

ASPHALT
ANALYSIS—2

REFINER'S NOTEBOOK

How to Make Component Analysis

by R. N. Traxler* and H. E. Schweyer†

THE procedure for analyzing an asphalt into asphaltics, paraffinics, and cyclics by The Texas Co. method will be outlined.

Scope

1. This method is applicable to asphaltic materials having a flash point above 162.8° C. (325° F.), and is intended to provide information concerning the general chemical composition.

Apparatus

2. The only special apparatus required is a constant-temperature cabinet at —23.3° C. (—10° F.) suitable for 18-hour storage.

Solvents

3. The solvents employed may be recovered for future use if excess contamination is avoided during the distillation steps.

(a) n-Butanol: Synthetic (boiling range 1½° C. including 117.7° C.).

(b) Acetone: Technical (boiling range 1° C. including 56.1° C.).

Procedure

4. (a) Asphaltics (A):

A 5-g. sample is weighed, to the nearest milligram, into a 300-ml. Erlenmeyer flask. Approximately 2 g. (not weighed) of Johns-Manville Celite Analytical filter aid is added to the flask. Normal butanol is added in the ratio of 20 ml. per gram of sample and the mixture placed on a hot plate with a suitable air reflux condenser. The mixture is boiled for 5 minutes (½ hour for materials having an A.S.T.M. Ring and Ball softening point above 79.4° C. [175° F.]) and after cooling is held at 50° C. (122° F.) for 16 to 18 hours.

After standing, the suspension is shaken and a portion is poured onto an asbestos mat in a 2½-in. Buchner funnel which is held by a suction flask. The suspension is allowed to settle for several minutes without suction in order to coat the mat with filter aid. Suction is applied slowly to obtain the maximum benefit of the filter aid and the remaining suspension is then filtered at a minimum vacuum usually not over 15 to 25 in. of mercury. The residue in the flask is washed with 50 ml. of n-butanol in 10-ml. increments which are poured, successively, onto the residue held by the asbestos mat.

The combined filtrates in the suction flask are then poured into a weighed 400-ml. thin-wall flask used for rubber extractions. About 25 ml. of solvent is used to wash out the suction flask. The residue in the original flask and on the filter is extracted with a sufficient quantity of hot benzene (usually about 100 ml.) to leach out the asphaltics. The benzene extract is then poured into a weighed 250-ml. Erlenmeyer flask and the solvent removed by distillation. The asphaltics are recovered by evaporation of the last traces of benzene on a steam bath or in a mechanical convection oven at 104.4° C. (220° F.) to a constant weight.

The 400-ml. flask containing the n-butanol extract is placed on a hot plate, and using a suitable condenser, the solvent is recovered for reuse by distilling it from the extract, care being taken that the temperature does not exceed 140.6° C. (285° F.). The flask containing the extract is then placed in a ventilated oven at 162.8° C. (325° F.) until a constant weight is obtained (about 1 to 2 hours). After cooling, the flask and contents are weighed to the nearest milligram, and the per cent of extract (paraffinics plus cyclics) is determined.

(b) Paraffinics (P):

The n-butanol extract is treated with 35 ml. of acetone per gram of extract, refluxed at the boiling temperature for 10 to 15 minutes using a rubber extraction apparatus or a long air reflux condenser and refluxing at a rate of 60 to 120 drops per minute. The flask and contents are then cooled and placed in a low temperature cabinet at —23.3° C. (—10° F.) for 16 to 18 hours. The acetone extract (cyclics) is decanted into a weighed 250-ml. Erlenmeyer flask (in some cases it may be necessary to filter the extract through a chilled Gooch crucible to obtain a complete separation). The paraffinics (residue) are determined by drying the extraction flask to constant weight on a steam bath or in a mechanical convection oven at 104.4° C. (220° F.). (In those cases where it is necessary to filter the extract through a chilled Gooch crucible in order to separate precipitated paraffinic material, the residue on the crucible must be leached out with hot benzene, the extract is added to that in the extraction flask, and the mixed solvent removed by distillation with subsequent drying of the residue.)

(c) Cyclics (C):

The 250 ml. Erlenmeyer flask containing the acetone extract is placed on a hot plate, and using a suitable condenser, the solvent is recovered for reuse by distilling it from the cyclics (extract). The cyclics are determined by drying the flask to constant weight on a steam bath or in a mechanical convection oven at 104.4° C. (220° F.).

Tests on Fractions

5. Where recovery of the asphaltics is not required, the benzene extraction from the filter aid can be omitted with the asphaltics being determined by difference. The paraffinic and cyclic fractions are usually retained for determination of their refractive indices at 70° C. (158° F.).

Reproducibility

6. Check analyses for any one component should be in agreement within plus or minus 0.3 per cent of averaged results.

Time Required

7. Twelve samples can be separated into three components by one operator in three 8-hour days, or 2 man-hours per sample.

Validity of Method

The method is simpler and more rapid than those proposed heretofore. Of greater importance is the fact that the data obtained by component analysis provide qualitative information concerning the chemical composition instead of merely showing differences or similarities among asphalts which is often the case with present methods. Although the component analysis method as proposed is limited to three fractions, there is no reason that each fraction cannot be subdivided further if such refinements are desired. For example, wax determinations might be made on the paraffinic fraction.

*The Texas Co., Port Neches, Tex.
†University of Florida, Gainesville, Fla.

EQUIPMENT MEN . . . in the News

Bloebaum Is Named District Manager by Marley Co.

The Marley Co., Kansas City, manufacturers of water-cooling towers and cooling equipment, has announced the appointment of Orville Bloebaum as San Francisco district manager. He succeeds the late A. C. Elias.

Bloebaum joined the Marley organization in 1949. Since that time he has served in the engineering research department, as an application engineer in the industrial cooling-tower department, and as a sales engineer in Marley's Chicago office.

Three Appointments Named By Oil Well Supply Co.

Three appointments in the Mid-Continent area have been announced by Mark Barkhurst, area manager for U. S. Steel's Oil Well Supply division.

Fred R. Luther has been appointed manager of Oilwell's store at Elk City, Okla., succeeding D. E. Richeson, who has been transferred to the Oklahoma City Oilwell store as field representative. John A. Fisher, formerly in the Rocky Mountain area, has been appointed area manager, machinery sales, and will headquarter in Tulsa.

Prior to his present appointment, Luther was employed in the Oilwell stores at Wewoka and Duncan, Okla. He entered the employ of Oilwell in February 1950.

Richeson, who began work for Oilwell in February 1948, was manager of the Elk City, Okla., Oilwell store before his appointment as field representative for the Oklahoma City store.

Fisher, who was employed by the company in April 1927, was area manager of machinery sales at Houston and Casper, Wyo., prior to his current appointment.

Cooper-Bessemer Corp. Expands Chicago Office

The appointment of R. L. Moore as sales engineer to Cooper-Bessemer's Chicago office has been announced by Stanley E. Johnson, vice president in charge of sales for The Cooper-Bessemer Corp., Mount Vernon, Ohio.

Working under the direction of Charles L. White, district manager, and Robert Bowie, Chicago office manager, Moore will devote his efforts to the engineering and sales of diesel and gas engines, air and gas compressors for manufacturing and chemical operations in the Midwest.

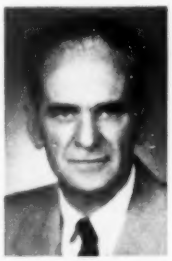
Moore is a graduate of University of Toronto. For the last several years he has been engineering the application of compressors to essentially every type of industry.

Three Promotions Named By Bovaird Supply Co.

C. F. HAMM

Roscoe G. Ayers, vice president and general manager of sales for Bovaird Supply Co., Tulsa, recently announced three company promotions. Charles F. Hamm, for many years purchaser for Bovaird, has been made manager of machinery sales. Earl M. Henson has been promoted from the Tulsa sales office to the Dallas sales office

E. M. HENSON



J. A. METZER

where he will supervise sales in the Dallas and Fort Worth area. J. A. Metzer succeeds Hamm as purchaser.

Hamm has been with Bovaird for 16 years, following 10 years with Pure Oil Co. He has been active in the Purchasing Agents Association of Tulsa, having served as educational chairman and board member.

Henson has been city representative of Bovaird for the past year, and prior to that he had been training in the office and stores division in prepration for his new position.

Metzer, formerly assistant purchaser for Bovaird before his new appointment, has been active in the Purchasing Agents Association of Tulsa.

Bovaird Supply has sales offices at Tulsa, Wichita, Dallas, Midland, and Houston, Tex., which augment 18 stores strategically located in Oklahoma, Kansas, Illinois, New Mexico, and Texas areas.

Baker Promotes Mitchell To Kansas District Manager

G. W. MITCHELL

Baker Oil Tools, Inc., has announced the appointment of Garey W. Mitchell as district manager of its Kansas district, effective August 1, 1953.

Mitchell attended Fort Hayes State College at Hayes, Kans., and joined Baker in 1945. Since that time he has been branch manager of the company's Great Bend, Kans., branch, and later was appointed subdistrict manager of the Mid-Continent district. Mitchell will establish a district office at Wichita.

Ardun Supply Co. Moves To Larger Quarters

Expanding industrial activity and the general growth of the oil industry has resulted in Ardun Supply Co. moving to larger quarters, according to an announcement made by H. W. (Doc) Arduser and R. H. (Bob) Duenner, who head the company.

Ardun Supply Co. was formed in January 1949, and has become known, in the industrial and petroleum areas of the Southwest, for quick, efficient, dependable service. This company is stocking distributors of welding fittings, flanges, pipe valves, gages, tubing, and tube fittings. This move will enable the company to stock brass and steel condenser tubes, pressure tubing, and a more complete line of oil-field supplies.

In its new location Ardun Supply will have, in addition to more office and stock room, larger and more complete warehousinging facilities.

West Named General Sales Manager by Climax Engine

Carl G. Preis, president of Eversharp, Inc., has announced the appointment of E. D. West as general sales manager of its Climax Engine & Pump Manufacturing Division, with headquarters in Chicago. West has been associated with Climax for 19 years as a sales executive.

Two additional appointments were also announced by Preis. Fred W.

THE PROOF IS IN THE FIELD . . .

Carter

Long-stroke Hydraulic Pumping Units

Featuring the amazing Variable-Cycle Principle

Designed — Built — Priced FOR STRIPPER WELLS

CALIFORNIA

Carter Unit Pumping in Edna Field, has been in service for seven years.

KANSAS

One of 4 units in the Great Bend Area, pumping from 3400 ft., owned by large independent.

EAST TEXAS

One of 9 Carter Units owned by a major oil company in Kilgore and Turnertown Areas. Pumping attainable from 3300 ft. Total cost about 60% of the cost of a conventional unit.

OKLAHOMA

One of seven units owned by an independent in the Tulsa Area, pumping from about 1500 ft. Operator reports production holding up better than offsetting wells with conventional units.

KENTUCKY

Carter Unit on 13-ft. substructure in the Green River Sections. Operator saved about 50% on substructure cost alone. This is one of seven units owned by this independent.

NORTH TEXAS

...stroke conversion installation in Cooke County, pumping 30 bbl./day from 6200 ft. No rod failures in more than a year's operation. Total cost about 30% of the cost of a conventional unit.

CANADA

Carter Unit operating in 30° angle-beam service in the Carbondale Field, showing adaptability of Carter Units to extreme climatic conditions.

SOUTH TEXAS

Production increased from 3½ bbl./day to 4 bbl./day on this 2790-ft. well in the Duval County Area, when it replaced conventional equipment. This is one of 11 units owned by this independent.

WEST TEXAS

Carter unit in the Spraberry Area, pumping from 7000 ft. This unit was installed for about 30% of the cost of a conventional unit.

MORE THAN 700 UNITS NOW IN SERVICE!

MORE THAN SEVEN YEARS OF FIELD EXPERIENCE!

From Canada to the Gulf, from Ohio to the Pacific, Carter Long-Stroke Hydraulic Pumping Units are saving thousands of dollars, for majors and independents alike, through lower first cost and maintenance as well as increasing production in many cases.

WRITE FOR BULLETIN PR-253

S. C. CARTER COMPANY, inc.

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Sales and Service Representatives in —

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Export: Calgary • Edmonton • Caracas • Maracaibo • Puerto La Cruz • Port of Spain

Neubauer, who has been with Climax for 35 years, has been appointed plant manager of its Climax Manufacturing Division at Clinton, Iowa. Ted Skeen, district manager with headquarters in Dallas, will be in charge of sales and service throughout the Mid-Continent area. He has been with the company in an executive sales capacity for the past 7 years.

E. J. Anselman, former general manager, has resigned.

Warnock To Head Sales of Birmingham Tank Co. Division

R. B. WARNOCK

Robert I. Ingalls, Jr., chairman of the board, The Ingalls Iron Works Co., Birmingham, Ala., has announced the appointment of Robert B. Warnock in charge of sales of the Birmingham Tank Co. Division.

Warnock is a mechanical engineering graduate of Georgia Institute of Technology. Following his graduation he was employed as an engineer by Douglas Aircraft Co., and later joined The Texas Co. organization as an industrial sales engineer.

Warnock will make his headquarters at the executive offices of The Ingalls Iron Works in Birmingham.

Arthur G. McKee Announces Retirement of W. A. Haven

Announcement was made recently by H. E. Widdell, president of Arthur G. McKee & Co., of the retirement of William A. Haven as a vice president of the company. Haven, who has been in charge of the company's metals division, will continue as a director of the company and as a consultant. He had been vice president of the company for the past 25 years.

As a result of Haven's retirement, the board of directors elected Merrill Cox, vice president, metals division, administration and sales; and A. L. Foell, vice president, metals division, in charge of engineering.

Both Cox and Foell have been with the company for 24 years. Cox, presently general sales manager of the metals division, has also held the positions of service engineer, assistant chief engineer, and sales manager of the metals division. Foell, until he became technical director of the metals division a year ago, had been chief engineer of that division since he became associated with the company in 1930.

P.E.S.A. Announces Date of District Membership Meet

The board of directors, Pacific district of Petroleum Equipment Suppliers Association, has announced a Pacific district membership meeting for October 28, 1953, at the Ambassador Hotel Theater and Embassy Room.

Ott Hammer, chairman of the board, has appointed a committee composed of T. Sutter, chairman; H. E. Howard, and H. J. Hagn to assist with details for this meeting. A program of interest is being arranged especially for department heads, such as sales, service, and credit managers, and others interested in association activities.

Richard Klinger, Ltd., Forms Klinger Corp. of America

An announcement has been made by Richard Klinger, Ltd., Sidcup, Kent, of the formation of The Klinger Corp. of America, Hoboken, N. J. L. O. Arringdale, president, Vincent Maxwell, and Raymond Oksala, senior engineers, have placed themselves at the disposal of all interested in Klinger products, and also have assured the continuation of all Klinger services.

Durametallic Corp. Adds Heath to Sales Staff

J. H. HEATH

Joseph H. Heath has joined the sales staff of Durametallic Corp., with offices at Houston, according to an announcement made by Allison Walker, manager of the sales and service offices.

Heath is a graduate of Texas Christian University and has been selling in the mechanical field for the past 5 years. He will concentrate his activities in promoting sales of Durametallic packings and packing tools.

Fischer Joins Macco Co. Sales Organization

Alfred O. Fischer has joined the sales organization of Macco Oil Tool Co. and will be associated with Oris Orton in the South Texas distributorship, according to an announcement made in Houston by W. C. Carlisle, president.

Fischer is a graduate of Texas A. & M. in petroleum and mechanical engineering, and was formerly associated with Stanolind Oil & Gas Co. in research and producing department activities.

The new sales outlet will primarily handle Macco gas-lift equipment. Headquarters will be in Alice, Tex.

O-C-T Announces Personnel Changes and Transfers

MIKE HUNTER

A number of personnel changes and transfers have been announced by Oil Center Tool Co., of Houston.

Mike Hunter will assume full charge of the company's Rocky Mountain district, which includes North Dakota, South Dakota, Montana, Wyoming, Nebraska, and eastern Colorado. His headquarters will be in either Denver or Casper, Wyo.

WALTER BURKE

GEORGE BERG

Walter Burke is the company's new Southwest Texas district manager. His office will be in Corpus Christi. George Berg has been appointed district manager in the Houston office.

L. D. McKay to Represent Pickering Governor Co.

L. D. McKay, manufacturers' representative in Tulsa, and distributor for Farris Engineering Co., Palisades Park, N. J., has taken over the Pickering Governor Co. account. McKay has represented Farris Engineering Co. for many years, and the announcement of his new association with Pickering follows the recent purchase of that company by Farris Engineering.

Lane-Wells Opens New Truck Station, Sales Office

Lane-Wells Co. has established a truck station at Graham, Tex., with W. D. Capper as station superintendent.

The company has also established a district sales office at 910 Carondolet Building in New Orleans. W. B. Vice, Jr., is in charge of this new office.

about GOODALL Rotary Hose

Goodall has been FIRST with every worthwhile rotary hose development!

Here are some "eye-opening" facts about Goodall Long-Life Rotary Hose that it will pay you to consider before you make your next rotary hose purchase. First, Goodall is the only rotary hose with the built-in Barney Coupling. It is the only coupling that can be reset to save your hose from the scrap heap. Second, Goodall's flexible cord design has eliminated the cause of more than 90% of rotary hose failures. Next, Goodall Long-Life Rotary hose is strong, flexible, perfectly balanced. In addition, Goodall is the only rotary hose manufacturer that can protect your rotary hose investment with a maintenance plan. And finally, you pay no premium price for the extra quality, long life and high salvage value of Goodall Long-Life Rotary Hose. It costs no more than ordinary hose. So that's why we would like to suggest that you open your eyes to the facts about Goodall Long-Life Rotary Hose. There's none better on the Market!

Attention Goodall Rotary Hose owners: NEVER DISCARD A GOODALL ROTARY HOSE UNTIL YOU CONTACT US.

GOODALL RUBBER COMPANY
TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Odessa, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
STOCKING DISTRIBUTORS: Texas and Louisiana — Houston Oil Field Material Co.; Wilson Supply Co. Oklahoma — Iverson Supply Co.

DIGEST OF NEW EQUIPMENT

IT'S NEW — CHECK IT

TRADE LITERATURE

1 CATHODIC PROTECTION WITH ZINC ANODES is a new 49-page book describing use of zinc anodes in cathodic-protection systems. Descriptions are given of use in distribution piping networks, transmission pipe lines, heat-exchanger and condenser applications, protection of underground lead-sheathed cables, and in water systems. Properties of zinc anodes and design and installed data are included; 36 figures and charts illustrate the book. *St. Joseph Lead Co.*

2 BULLETIN NO. 383 presents new Ideal Type 80-B consolidated rig, an 800-hp. rig for medium-depth drilling. Rig construction and operating features are described with many illustrations. Drive groups, shaft-speed diagrams, and engineering specifications are included. *The National Supply Co.*

3 ALCOA ALUMINUM IN THE PROCESS INDUSTRIES, an eight-page booklet, describes uses of aluminum in petroleum and chemical industries. It discusses Alcoa products for processing industries; lists economic advantages of aluminum; gives tables covering materials handled safely with aluminum, composition and properties of aluminum alloys, and other engineering information. *Aluminum Co. of America.*

4 WIRELON is an unusual type booklet describing properties and qualities of Wirelon ropes available in a complete range of sizes, strengths, and other physical characteristics. Booklet also gives specifications, as well as numerous applications in various branches of the petroleum industry. *Rochester Ropes, Inc.*

5 KEWANEE M-800 SCOTCH BOILER FOR OIL OR GAS. This multicolored six-page catalog contains a full description of the M-800 quality features, with detailed listings of ratings, dimensions, standard equipment, and trim. M-800 Series is ideal for use with any quality oil, gas, or combination oil-gas burner to form a complete boiler-burner unit. *Kewanee-Ross Corp.*

6 TYPE H MOTOR STARTERS built to control squirrel-cage, synchronous, wound rotor and multispeed motors in ratings from 2,200 to 5,000 volts are described in a new 12-page bulletin. Starters in ratings up to 3,000 hp. at 5,000 volts are available with air or oil contactors depending upon application requirements. Complete protection features of the starters are covered in the bulletin, which also carries schematic wiring diagrams showing typical methods of control. *Allis-Chalmers Manufacturing Co.*

7 FLEXON EXPANSION JOINTS, cmh FLEXIBLE METAL HOSE, a new 16-page illustrated two-color catalog, presents all basic selection and installation data necessary to proper application of flexible metal hose and pipe-line expansion joints. Catalog gives complete specifications for both low and high-pressure units, and on basic Chicago metal hose corrugated and convoluted hose construction, as well as information on fittings. *Flexonics Corp.*

8 TRANSFORMERS. Bulletin EU-106 illustrates and describes Class B insulated 80°C. rise dry-type transformers, in ratings 3 through 100 kva., single-phase, 600 volts and below, featuring Wagner Form W construction, with cores of cold rolled oriented grain steel. Transformers are housed in ventilated steel enclosures, ratings 3

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Corresponding to new equipment items or trade literature abstracts in the Oil and Gas Equipment Digest of The Oil and Gas Journal, Sept. 14, 1953

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OIL AND GAS EQUIPMENT Digest CHECK IT

through 15 kva. suitable for indoor or outdoor service, larger ratings for indoor use only. *Wagner Electric Corp.*

9 APPLICATIONS UNLIMITED. Ways in which beryllium copper can help engineers solve design problems are illustrated by actual uses in this 16-page booklet. Among problem-solving qualities of beryllium copper illustrated are ease of fabrication, high strength, good electrical and thermal conductivity, excellent resistance to wear and corrosion, and unusual castability. *The Beryllium Corp.*

10 SMALL FLOW-REDUCING VALVE. New small flow bronze or steel reducing valves for steam, air, gas, or liquid service are described in Bulletin 511-A. Compact, rugged, reducing valves handle inlet pressures to 1,000 psi. and reduced pressures from 2 to 400 psi. Complete capacity tables for our sizes of controlling valves from 3/32 to 5/16 in. are included to facilitate sizing. *Leslie Co.*

11 HIGH-PRESSURE TUBE AND PIPE FITTINGS, a new 28-page, 4-color general catalog, covers complete line of high-pressure tube and pipe fittings. Described and illustrated with cutaway drawings and photographs are "Prize Pair" flare and no-flare-type tube fittings which seal pressures that will burst the tube. Engineering tables are supplemented with complete specifications on all fittings. *Flodar Corp.*

12 ARC-WELDING MACHINES. This 44-page catalog describes over 20 different models, including a.c., d.c., and Inert-Gas models, which are illustrated with complete descriptions covering specifications, features, and electrical data. Catalog also includes sections on accessories and electrodes required to perform a particular arc-welding job. Various types of running gear, foot controls, and an automatic arc-welding head are also discussed. *Air Reduction Magnolia Co.*

13 BAILEY METERS & CONTROLS FOR THE PROCESS INDUSTRIES is a 16-page catalog describing complete line of instruments for metering and automatically controlling 17 process variables. Written for process and instrument engineers, it offers ranges, basic specifications, and detailed literature references on all nstruments. *Bailey Meter Co.*

14 SOLVE YOUR CAR-HANDLING PROBLEMS. Bulletin T-112, presents improved operational features of Trackmobile Model 2TM and how they help users achieve lower-cost freight-car handling. Bulletin describes such advantages as electric sanders, improved road wheel drive and steering, and increased chain-drive power for a maximum drawbar pull of 8,400 lb. Also included are complete specifications, performance and dimension tables. *Whiting Corp.*

15 B-J MECHANICAL PUMP SEAL, a new 15-page brochure, Bulletin No. 153-10000, contains 46 photographs and drawings showing various changes in pump pressure areas and the single and double balanced and unbalanced seals. The text, condensed from a motion picture, explains operation of mechanical seals and supplements the illustrations. *Byron-Jackson Co.*

16 KIM HOTSTART ELECTRIC PREHEATER for diesel and gas engines. This loose-leaf catalog describes a device which plugs into any electrical outlet and through a percolator-like action keeps engine ready for instant starting even when vehicles are stored outside in subzero weather. Catalog illustrates typical installations, and specifications are listed for various sizes and types of engines. *Kim Hotstart Manufacturing Co.*

17 NUT AND BOLT DATA SHEET gives complete standard nut and bolt dimensions and thread data on engines, power units and generator sets, offered without charge to interested persons. *Murphy Diesel Co.*

18 LORAIN 80 SERIES, a new 12-page, two-color bulletin, fully illustrates and describes Lorain "80" Series power shovels and cranes in the 1¾-yd. class. Bulletin covers design and construction features with many pictures (some cutaway) of individual working parts. Air controls, and choice of crawler sizes and front-end equipment, are fully described and illustrated. *The Thew Shovel Co.*

FOR MORE INFORMATION . . . . use one of these cards.

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DIGEST OF NEW EQUIPMENT

IT'S NEW ✓ CHECK IT

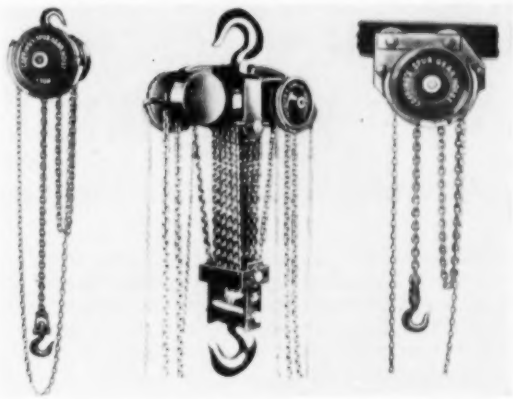
by Dan B. Miller

19 NEW RUBBER LINING PROCESS is a specialized method of molding soft or hard natural rubber, neoprene, or other compounds to the flange ends and inner flow surface of metal pipes to be used for conveying chemicals and other solutions requiring protection against corrosion, abrasion, or contamination. After being sand-blasted, the metal pipe to be lined is treated with a priming

solution and coated with special tie cement. A tube of coating compound is then inserted and adhered under pressure against the prepared inner pipe surface. When the flange ends are covered with the compound, steel molds set at a predetermined thickness are inserted approximately 2 in. into the pipe ends and bolted firmly to the flanges. An 8-hour vulcanizing treatment follows which accomplishes molding in addition to curing the coating compound. This method of applying coating assures an inseparable bond between metal and the coating compound. The coating material used is sufficiently elastic and resilient to accommodate contraction and expansion of the metal under maximum temperature variations. *Goodall Rubber Co.*

IT'S NEW ✓ CHECK IT

20 NEW UNITS ADDED TO SPUR-GEAR HOIST LINE. Included among new units are 15 sizes of single and multiple-chain spur-gear hoists with capacities from ¼ to 25 tons. For specialized applications, there now are plain and geared Army-type hoists, ¼ to 10 tons; low headroom hoists, 1½ to 24 tons; clevis-connected hoists, ¼ to 10 tons; and extended hand-wheel hoists from ¼ to 3 tons. In the Army and low-headroom models, the hoist is an integral part of the trolley. Trolley may be plain or



geared. The advantage of this design is that it permits hoists to work where lack of headroom prohibits the use of standard units. Clevis-connected hoists are used where speed and efficiency of conventional Coffing spur-gear hoists are desired, but where headroom is gained by removing the top hook and suspending the hoist from a specially designed trolley clevis. This method of connection saves from 3 to 16 in. headroom, depending on size of the hoist used. *Coffing Hoist Co.*

IT'S NEW ✓ CHECK IT

21 WRENCH COMBINES DEBURRING, NONSLIP FEATURES. This new utility wrench is designed for easier and faster assembly of thin-wall fittings, and combines deburring and nonslip tightening in one tool. The wrench is for use with Appleton compression-type couplings and connectors and economy two-piece connectors. It is available in two sizes, each with double ends, to handle ½ and ¾-in. or 1 and 1¼-in. fittings. Made of hardened drop-forged steel, it is smoothly finished for comfortable gripping and scientifically balanced for proper leverage. The renewable deburring and

KEEP INFORMED ✓SAVE TIME ✓TEAR OUT CARD ✓CHECK IT ✓MAIL IT

This Digest of New Equipment offers you a quick resume of important features of new or improved products and trade literature and the opportunity to obtain complete information on each subject by use of the convenient "CHECK IT - MAIL IT" service card.

What's NEW

In Perforating, Logging, and Fishing Tool Services

Latest News About New Tools, Techniques and Services

NEW

McCULLOUGH *Radiation Well Logger with* SCINTILLOMETER (GAMMA RAY AND NEUTRON LOGS)

Accurate, Reliable, Consistent and Stable Logs on Every Run in the Well

Present day well completion programs are often based solely on logging information. Therefore, that information must be accurate and consistently reliable. The security of your entire drilling investment depends on the dependability of the information given by the log.

That's why operators everywhere are specifying the amazing new McCullough Radiation Well Logger with Scintillometer. It is the most accurate and reliable logging instrument available to the oil industry. It is a stable instrument, and because of its stability, it is consistently reliable—one or ten trips in the same well, you'll always get the same answer.

Here are some of the reasons why the McCullough Radiation Well Logger with Scintillometer gets such accurate, dependable results:

1. The Scintillometer is very short compared to the length of gaseous type counters. This enables the measurement of formations with a great deal more detail. It will measure and define very thin beds that would be averaged out with the longer counters.

2. The efficiency of the Scintillometer in measuring radiations approaches 100%. Gaseous type counters may have an efficiency in the order of 2% or less.

3. As a result of the short length and high efficiency of the Scintillometer, a much more detailed log can be produced at a faster logging speed than with other methods.

4. The Scintillometer responds only to external excitation and thus can be calibrated on an absolute scale. This scale is in International Units and assures a more accurate quantitative interpretation.

5. Because of the extreme stability of our equipment, we are able to duplicate successive runs in the same well with accuracy.

6. Characteristics such as time constant and sensitivity are controlled at the surface. Thus, these variables can be set to provide the operator with as much or as little detail in his log as he desires.

7. The Scintillometer will record the entire range of gamma radiations, or only a certain band within the range can be recorded if desired.

8. It has no instrument, temperature nor discernible cosmic drift and can be used as a valuable reference tool.

9. Simultaneous recording of a collar log simplifies "pin-point" perforating later.

10. The original record is reproduced as the final log—no retouching nor tracing is necessary.

THE McCULLOUGH RADIATION WELL LOGGER WITH SCINTILLOMETER (GAMMA RAY AND NEUTRON) IS AVAILABLE IN MOST ACTIVE OIL FIELDS—CALL YOUR McCULLOUGH SERVICE ENGINEER FOR COMPLETE INFORMATION

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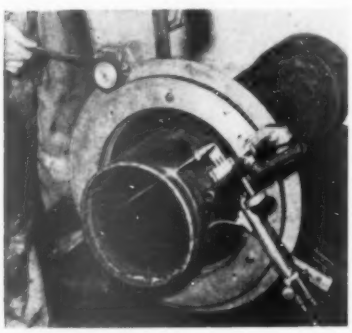
nonslip plate is case hardened. As a deburring tool, the combination wrench smooths newly cut ends on thin-wall conduit, inside and out, simultaneously. When used as a wrench the nonslip shoulder plate and overlap lip hold the wrench snugly, both horizontally and vertically, on the individual nut to be tightened. This eliminates slippage in close quarters and on overhead work. Between tightening turns, the wrench is lifted slightly off nut and turns freely on the rounded edge of the nonslip shoulder plate. *Appleton Electric Co.*

IT'S NEW CHECK IT

22 NEW REDUCER INSERT TEE FITTING is for connecting flexible plastic pipe. The side outlet is one standard pipe size smaller than the run. This new fitting is available in run size up to 2 in. The new reducer tee facilitates installation of step down laterals. This new fitting is quickly and easily joined in the same manner as used for standard insert couplings. Sections of pipe are cut to desired length and fitting inserted. Stainless steel clamps are tightened over the pipe and fitting to draw the pipe down over the serrations of insert to assure positive leakproof joint. No special tools are required and complete connection can be made within 2 minutes. *Carlon Products Corp.*

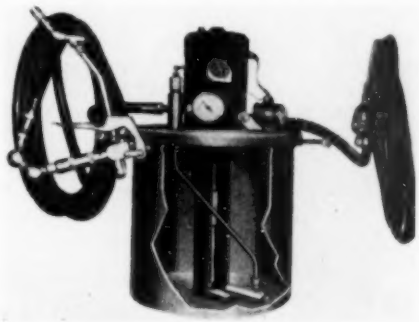
IT'S NEW CHECK IT

23 SPRINGLOAD ACETYLENE CUTTER cuts and bevels steel pipe with absolute accuracy in one and a half minutes. The new torch cutter has a traveling carriage attachment and clamp which holds the torch in a fixed position in relation to the pipe as it rotates. The machine is designed to keep the torch at a proper distance and angle and is so mounted on a precision universal chuck that it holds within 1/64 in. of accuracy. A hand-operated crank is used to advance the torch. A one-man tool, the torch will cut 10-in. pipe in approximately 2 minutes, with absolutely even cut and bevel all around the pipe. It comes in two sizes, 4 to 12-in. and 12 to 20-in. *Springload Manufacturing Corp.*



IT'S NEW CHECK IT

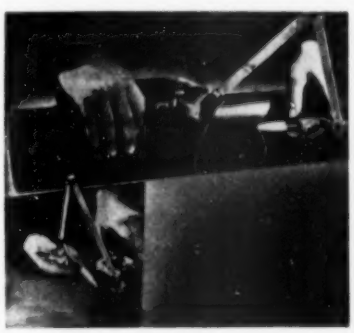
24 GREASEMASTER, a battery-powered portable lubrication unit makes low-cost grease jobs available at a fraction of the usual initial cost. Investment in pressure tanks and motors is eliminated because the Greasemaster is an electrically driven hydraulic ram pump which is operated off an ordinary auto or tractor battery. The grease unit fits on top of any standard size 25, 35, or 40-lb. grease



container. A 10-ft. cable attaches to the battery and a 25-ft. flexible greasing hose with a swivel coupler services all types of fittings. Pressure can be varied up to 12,000 psi. for high-pressure greasing. A pressure regulator can be set to protect sealed bearing to prevent rupture. *G & T Industries.*

IT'S NEW CHECK IT

25 CONTOUR MARKER. Average pipe joint can be marked for cutting in less than 5 minutes. An articulated arm with soapstone point and a dial marked in both degrees and pitch are mounted on a base which is curved to rest on pipe. When the dial is set to the desired angle the jointed arm traces the cutting line clear around the pipe. This device is intended to speed up pipe layout and to prevent the waste of man-hours and cutting gas which occur with old-fashioned methods. Two models are available: standard for pipe ranging from 1½ to 18 in. in diameter; jumbo from 16 to 48 in. in diameter. *Contour Marker Corp.*



IT'S NEW CHECK IT

26 NEW WIRE BRAIDED BUTANE-PROPANE HOSE. Ironsides butane-propane hose is a new type of butane hose combining layers of horizontally braided steel wire and rayon cord reinforcement. Specially devel-

oped for the handling of liquefied petroleum gases, this hose features a nonporous and oil resistant rubber tube and extra strong reinforcement. Each size has a minimum burst of 1,750 psi. with actual burst pressures exceeding 2,300 psi. Each length has two separate static wires, interlaced with the reinforcing braids, to insure full static conductivity. Made on a mandrel which insures uniform inside diameters for quick, positive coupling, the hose is available in sizes from ½ to 2-in. *Quaker Rubber Div. of H. K. Porter Co.*

IT'S NEW CHECK IT

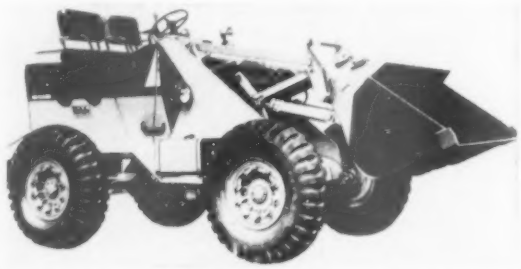
27 SOLENOID VALVE WITHOUT GASKETS. The efficiency of a much larger valve is claimed for this 5-oz. solenoid valve. Major parts are stainless steel, silver brazed for rigidity, with no gaskets used. It has a special strain relief lead wire grommet, with plunger of medium size and weight to insure operation under heavy vibration. A floating synthetic rubber needle valve insures positive closing at 0° pressure. Standard models have 1/16-in. orifice. No mounting brackets necessary and internal parts are easily accessible for cleaning. It operates up to 1,000 cycles per minute; pressure up to 200 psi.; straight-through flow; weight 5 oz.; power consumption 1 to 3 watts. Available in 6, 12, 24 volts d.c. and 100 volts a.c., with special voltages on request. *Specialty Products Co.*

IT'S NEW CHECK IT

28 NEW CHAIN-DRIVE OVERLOAD DEVICE. Designed to protect chain drives of all types from overload by tripping a limit switch in the event of excessive tension on the drive leg. The device consists of an eccentrically located idler sprocket counterbalanced by a weight-loaded arm. The counterbalance is adjustable so that the device will operate at any chain tension up to 1,000 lb. Design is simple, rugged and maintenance-free. A locking lever is arranged so that manual resetting is required to energize the drive once an overload has caused it to act. With an eccentric sprocket shaft of 0.875 in. in diameter, the unit can be adapted to chain sizes from ½ to 1¼-in. The electrical capacity of the limit switch is 10 amps at 115v., alternating current, which can be increased to any desired specification by the use of relays. Shipping weight is 20 lb. and the over-all dimensions excluding the counterbalance arm are 8¾-in. by 6¾-in. by 5⅛-in. The counterbalance arm extends 13 in. *Lamson Corp.*

IT'S NEW CHECK IT

29 NEW FOUR-WHEEL DRIVE SHOVELOADER. This unit is rated at 1½-cu.-yd. capacity with a recommended working capacity of 6,000 lb., peak capacity of 9,000 lb. Equipped with positive four-wheel drive, it is designed to eliminate need for a center differential transfer case. Hi-flotation tires and high under clearance permit efficient operation of the loader under extreme conditions of mud, snow, sand, and uneven ground. A 23-in. oscillation of the unit's rear axle keeps all four wheels solidly in ground contact on rough terrain, insuring best function of the four-wheel drive. Its five-speed forward or reverse transmission coupled with shuttle gear transmission permits quick changes of direction. Power steering on all four wheels (optional) also adds to the operator's critical control of the unit. Parallelogram design of the loader mechanism keeps the blade or fork at the same angle regardless of the loader's attitude. Simple adjustment of the angle is made with the tilt cylinder, when required. Power for the unit is supplied by a six-cylinder Hercules engine. Loader mechanism is powered by a 1,200-psi. hydraulic system with gear-type hydraulic pumps. *Baker-Lull Corp.*



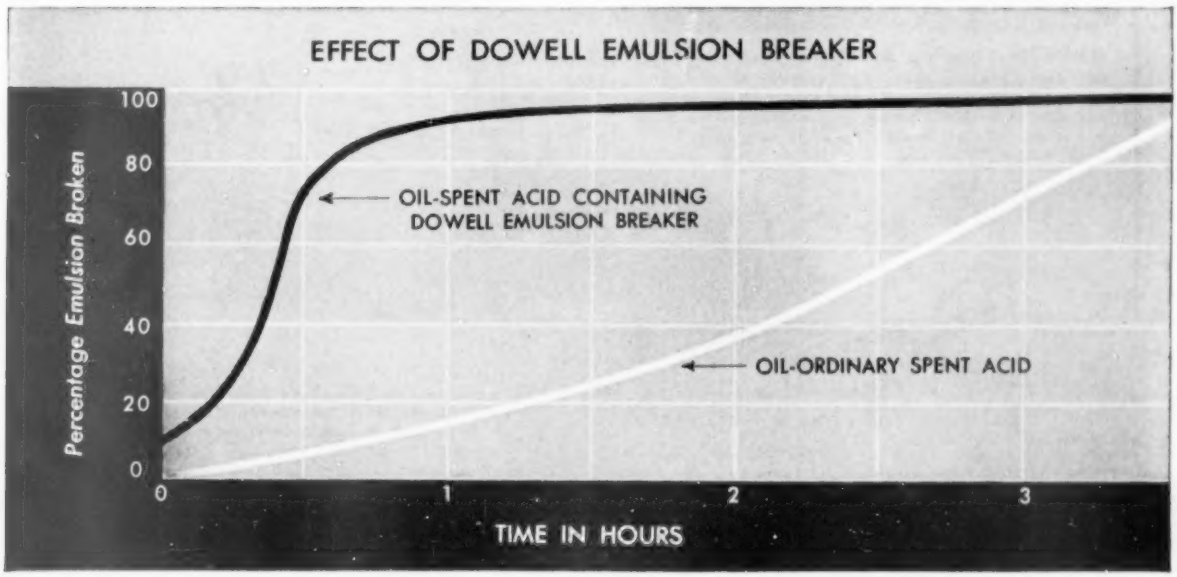
IT'S NEW CHECK IT

30 PILOT RELAY UNIT ADDED TO FLOW METER. A new differential converter unit incorporates a pilot relay transmitter that reduces air consumption to the minimum. The units, small, lightweight instruments for precise measurement of flow in industrial processes, convert the differential pressure of flow into air pressure, transmitting this through tubing to indicating, recording, or controlling instruments. The new differential converter with the pilot relay transmitter uses only one-sixth as much air as the conventional nozzle-pressure transmitters. They are also virtually unaffected by variations in the air supply. Highly responsive to changes in flow, the new relay permits control within the close tolerances necessary to many industrial processes. The fact that the differential converter units do not use mercury means that maintenance has been simplified and the problem of contamination eliminated. The compact units can be mounted right on the pipe line close to pressure taps. The differential converter units have a high temperature rating—meter bodies can stand process fluid temperatures up to 350° F. and the transmitter up to 225° F. *Minneapolis-Honeywell Regulator Co.*

IT'S NEW CHECK IT

EMULSION PROBLEM IN NEW WELL SOLVED WITH XW ACID TREATMENT

Fast clean-up resulted from DOWELL treatment with inhibited acid plus demulsifying agent



A wildcat well—5123 feet deep, with 77 feet of broken pay in hard, dolomitic lime—was exceptionally difficult to bring into production because of the presence of a stable oil/water emulsion.

The well could be produced only by bailing. Then, the operator contacted Dowell. After a careful laboratory study of the emulsion, Dowell recommended a three-stage treatment using inhibited acid containing surface tension reducing and emulsion breaking agents. The second stage of the treatment resulted in 2 BOPH production, swab and flow. The third and final stage brought a substantial production increase, flowing with no emulsion trouble.

Dowell addition agents have been developed to provide operators with answers to many of the difficult conditions encountered in oil, gas and water wells. These developments are the result of over 21 years of experience in oilfield services using chemicals. Other Dowell additive chemicals are designed to remove mud from producing formations; to speed reaction rate; to increase penetrating ability; to remove "gyp"; to trace fluid movement; to increase acid weight.

For more information on Dowell XW Acid, other addition agents and the many oilfield services and products offered by Dowell, contact the nearest Dowell Office. Or, write directly to Tulsa, Dept. 1-11.

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Acidizing • Perfojet • Electric Pilot • Paraffin Solvents • Fracturing • Corban® • Jelflake® • Bulk Inhibited Acid • Chemical Cleaning for Heat Exchange Equipment

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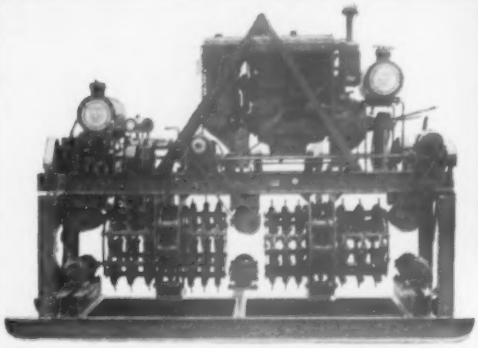
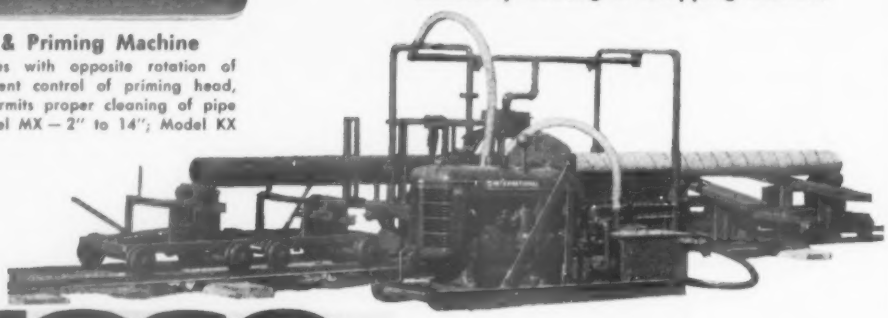
Here's a yard pipe reconditioning setup that will save you money!



Stationary Cleaning & Priming Machine

Has dual head assemblies with opposite rotation of cleaning heads. Independent control of priming head, and pipe input speeds permits proper cleaning of pipe in various conditions. Model MX — 2" to 14"; Model KX — 16" to 26".

Stationary Coating & Wrapping Machine



Designed to process pipe from 2" to 30". Hydraulically driven turn table permits smooth operation. Designed to apply single or multiple coats and wraps to specifications.

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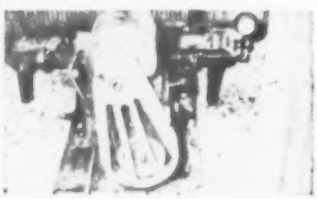

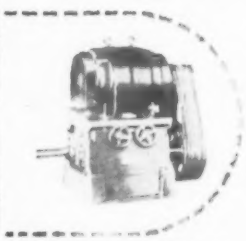

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GEAR the PUMPS to YOUR NEEDS:

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- Reduce "Peak Loads" (lower power costs)
- Turner transmissions are NOT expensive. They pay for themselves in a short time.

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PIPE LINES

Lakehead to Make Second Crossing of Straits This Week

ST. IGNACE, Mich. — Lakehead Pipe Line Co. expected to pull the second 20,000-ft. line across the Mackinac Straits here September 12 in conjunction with construction of its 644-mile, 30-in. crude line from Superior, Wis., to Sarnia, Ont.

The pulling was originally scheduled for September 6, but inclement weather caused the operation to be delayed. Dredging was completed well in advance, and last week trench-cleaning operations were being carried out by Merritt, Chapman & Scott Corp., contractor handling the crossing job. The entire pipe-line project is being managed by Bechtel Crop.

The first of the 20-in. lines was pulled across the Straits between August 9 and 15 *(The Oil and Gas Journal, August 24, page 171).*

FPC Not to Separate Issues In Huge Gas-Line Application

WASHINGTON.—The Federal Power Commission has denied a motion by Northern Natural Gas Co., Omaha, Nebr., to omit intermediate decision procedure on certain phases of the proceedings involving the company's application to build pipe-line facilities for transportation of an additional 300,000,000 cu. ft. of natural gas to Midwest customers.

The company wanted separated from the hearings those issues in the application approved last spring by the commission. These issues dealt with construction during the first 12 months of the 2-year project.

The approved plans called for construction of 259 miles of 24 and 30-in. pipe and a total of 50,400 hp. in compressor capacity in Texas, Oklahoma, Kansas, Nebraska, and Iowa. The second year program, which is now being considered by the FPC, calls for construction of 204 miles of 24, 26, and 30-in. pipe and 22,800 hp. in compressor capacity. However, the authorization of the first year's work is not valid until the remainder of the project is passed upon *(The Oil and Gas Journal, June 22, page 346).*

The $56,000,000 project includes a main line from El Paso Natural Gas Co.'s system in Dumas, Tex., to Omaha, with necessary branch lines and compressor stations *(The Oil and Gas Journal, May 11, page 163).*

Cities Service Building Two Terminals on Wolverine Line

BARTLESVILLE, Okla.—Cities Service Oil Co. has begun construction on its Toledo and Detroit terminals which will receive products from the East Chicago, Ind., refinery region over the 300-mile Wolverine pipe line, now being constructed.

The Toledo terminal will have storage capacity for 321,428 bbl. of products along with necessary loading facilities for tank cars and trucks. Also, the terminal, which will be located on the Maumee River, will have facilities to load Great Lakes tankers.

At the Detroit terminal, where the jointly-owned Wolverine line will terminate, Cities Service will have storage

Cities Service Lines Bridge Water

This unique structure on the Beaumont canal, designed by Arkansas Pipeline Corp., supports Cities Service Oil Co.'s 12 and 20-in. crude lines running from Sour Lake, Tex., to the company's Lake Charles, La., refinery. The supports were prefabricated in Beaumont and floated to the location. The pipe was bent to 90° angles at the factory.

See Composite and Refinery Catalogs, or Write for Folder On

FLEET-LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from 1/4" to 24" — ASTM A234

Also for pressure vessel heads

Nominal pipe sizes 1" to 24" — ASA B16.9, ASTM A234

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HOUSTON Ready-Cut HOUSE CO.

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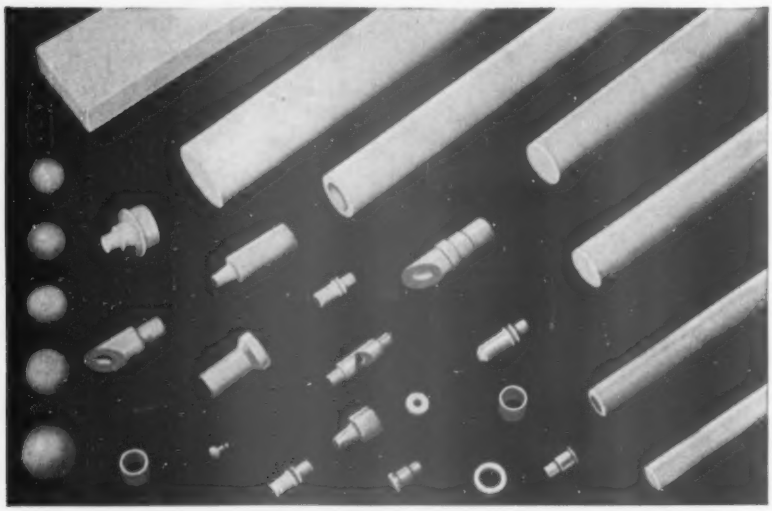

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Heavy demand has put many TEFLON fabricators in a "back ordered" condition. The effect — stymied or crippled production on your end.

At FLEXROCK we have licked this problem. New TEFLON producing equipment has been added. We have substantially increased capacity. We can't take on all things just yet. But soon we will be ready to "throw the book at you" with a complete range of TEFLON services. RIGHT NOW we are set to ship you TEFLON Rod and Tube, extruded or molded, Sheets, and small parts — no matter how intricate — machined from Rod and Tube. We can promise good delivery — yes, FAST DELIVERY . . . with closest possible tolerances on your small parts. Tell us your needs — we will be happy to quote delivery and price.

*DuPont trade-mark for tetrafluoroethylene resin

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facilities for about 190,476 bbl. of products.

The two terminals are expected to be completed when the products line is ready for operation early in 1954. The new line, which will have a capacity of 95,000 bbl. daily, is owned 40 per cent by Shell Oil Co., 35 per cent by Cities Service, and 25 per cent by The Texas Co. *(The Oil and Gas Journal, March 2, page 109.)*

Compressor Stations Planned For New California Gas Line

BAKERSFIELD. — Southern California Gas Co. is constructing a compressor station near here as a part of its expansion program on the company's Mountain View-Arvin-Lamont natural-gas system.

Contract for laying foundations for two compressor units in the new installation has been awarded to Oil Field Construction Co. here. The new station will compress field gas from this area to a 14-mile, 6-in. line which is expected to be completed this week by J. C. Lackey Construction Co. This new line will supply the firm's north-south main-transmission system with an additional 3,000,000 cu. ft. of gas.

Sunray to Start 440-Mile Products Line This Fall

TULSA.—Sunray Oil Corp. will begin work this fall on a 440-mile, 10-in. products line from its Duncan, Okla., refinery to a terminus on the Mississippi River.

The line will have an initial capacity of 40,000 bbl. daily and will give the company benefit of water-transportation rates.

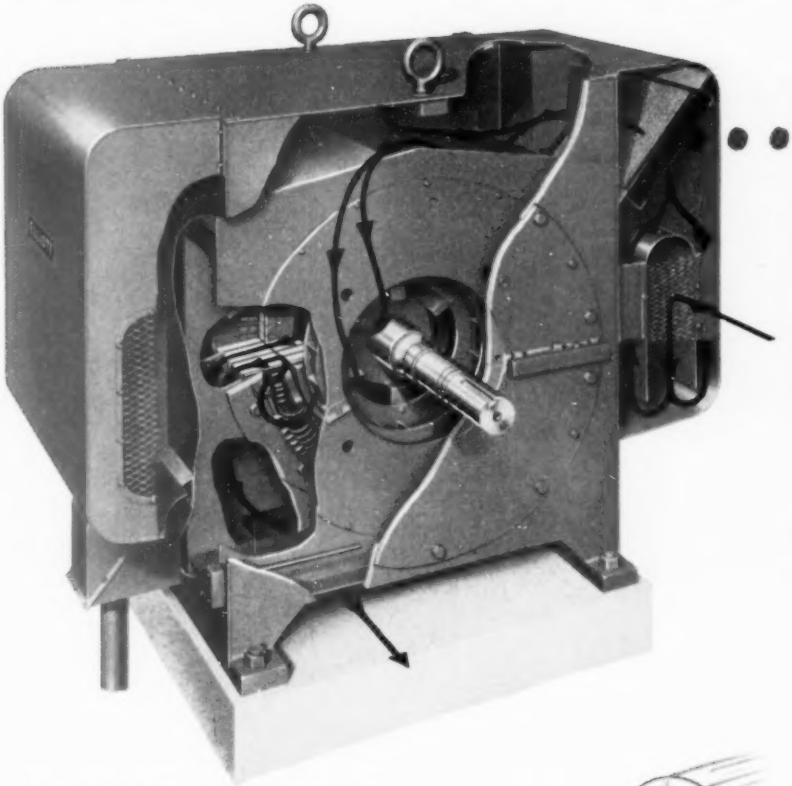
Tankers Being Replaced By Lakehead Crude Line

TORONTO, Ont. — Imperial Oil, Ltd., has sold two of its three new Great Lakes tankers since the 644-mile Lakehead line, now under construction from Superior, Wis., to Sarnia, Ont., will make water shipments of Alberta crude to eastern Canada largely unnecessary.

The Imperial Woodbend has been purchased by Mohawk Navigation Co. for conversion into a bulk carrier for Great Lakes duty. The Imperial Redwater was sold to Upper Lakes & St. Lawrence Transportation, and the Imperial Leduc remains to be sold.

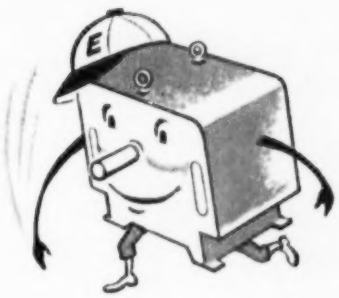
The new 30-in. line, which will have an ultimate capacity of 300,000 bbl. daily, connects at Superior with the Interprovincial system from the Alberta producing area, and will insure

ELLIOTT *OUTDOOR SPLASHPROOF WEATHER-PROTECTED* MOTOR



..strikes out building costs

Cutaway view showing passage of ventilating air through the series of ingenious baffles, positively excluding moisture and dirt from the motor windings.



STRIKE ONE

"Blow Thru" inlet and discharge openings prevent high-velocity winds from forcing dust or moisture into the winding chamber.

STRIKE TWO

Many changes in both direction and velocity of incoming air, knock out moisture and dirt. When required a cleanable air filter provides a further positive stop to air-borne foreign matter.

STRIKE THREE

Windings are specially "moisture-sealed," vacuum-pressure impregnated and dipped, insuring complete protection of electrical winding.

Here is a motor that can take any weather

and like it — torrential downpour, raging blizzard, fog, salt spray, sleet — a motor you can put outdoors anywhere and snap your fingers at building costs. Even special installation costs are out — no ductwork, no cored foundation, nothing more costly than a simple concrete slab. Numerous installations from New York to California, Minnesota to Texas, all tell the same story of economy. Get the facts in the new Outdoor Motor Bulletin. Ask your local Elliott representative or write Elliott Company, Ridgway Division, Ridgway, Pa.

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FIRST CHOICE for Secondary Recovery Water Flooding...

The lower the expense of producing source water from wells for water flooding operations, the greater the ultimate profit.

Reda Pumps for source water wells provide many ways for lowering these production costs.

Improved design and longer operating life *lower* the cost of labor per barrel, *lower* the cost of maintenance per barrel, *lower* the investment cost per barrel, *lower* the cost of fluid per barrel.

Also the ability of Reda pumps to produce greater volumes in limited casing sizes and from greater depths often reduces the number of source water wells required.

Reda engineers have long been associated with water flooding operations and are fully qualified to assist operators in discussing their source water requirements.

REDA
PUMP COMPANY
BARTLESVILLE, OKLA.

year-round deliveries to East Canada refineries (*The Oil and Gas Journal, August 3, page 34*).

FCC Issues Radio Permits To Six Pipe-Line Firms

WASHINGTON.—The Federal Communications Commission has issued construction permits to pipe-line companies for 2 base stations, 6 fixed developmental units, 2 fixed relays, and 150 mobile units, as follows:

Sun Pipe Line Co., Beaumont, Tex., for two fixed developmental units near Huffman on 956.1 mc., and near Humble on 959.7 mg.

Natural Gas Pipeline Co. of America, Chicago, for four fixed developmental units, two at Aurora, Ill., on 6,585 mc., and two at Downers Grove, Ill., on 6,705 mc.

Transcontinental Gas Pipe Line Corp., Houston, for two fixed relay units near Clinton, Iowa, on 48.70 mc.

Continental Pipe Line Co., Ponca City, Okla., for one base station at Vinson, Okla., on 33.38 mc.

Humble Pipe Line Co., Houston, for 150 mobile units in South and Southwest on 48.86 mc.

El Paso Natural Gas Co., El Paso, for one base station to cover Arizona, New Mexico, west half of Texas and Colorado, and south half of Utah on 48.74 mc.

Indiana Firm Plans Gas Line

WASHINGTON.—Northern Indiana Fuel & Light Co., Auburn, Ind., plans to construct a 35-mile, 10¾-in. line to supply 12 communities in that state with natural gas.

In an application to the Federal Power Commission, the company proposes to run the line from Panhandle Eastern Pipe Line Co.'s transmission system at Edgerton, Ind., to Northern Indiana's system at Auburn. Also, the company is seeking permission to get about 2,000,000 cu. ft. daily of gas for the proposed line from Panhandle Eastern.

The project will cost about $876,814, including converting customers' appliances to natural gas. Five of the communities the company plans to supply have been using manufactured gas. The others have had no gas service at all.

Phillips Completes Crude Line

ODESSA, Tex.—Phillips Petroleum Co. has completed a 26-mile, 6-in. crude line between its Fullerton field gasoline plant and production east of Andrews.

The project was handled by Moore Construction Co. here.

Everything to lubricate your plug valves *better* and *faster!*

Without obligation let us show you how to save ⅓ on your plug valve maintenance. Your valves will last longer, operate easier—and lubricate 10 to 15 times faster.

DELTA GUN and FITTINGS

The Delta High Pressure Gun and one-piece double-check fittings enable one operator to lubricate 10 to 15 valves in the time required to service 1 with jack screw. Delta fittings are available for ANY lubricated plug valve.

ONLY 4 DESCO LUBRICANTS HANDLE ALL VALVE SERVICES

No need to stock dozens of lubricants when only 4 Desco Lubricants do the entire job. Stays in your valves, keeps them easy to operate. Will not harden or cake-up, because no fillers or inert materials are used. Convenient gun size or jack-screw sticks or in bulk.

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DELTA AUTOMATIC PLUG VALVE LUBRICATOR

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NATURAL GAS

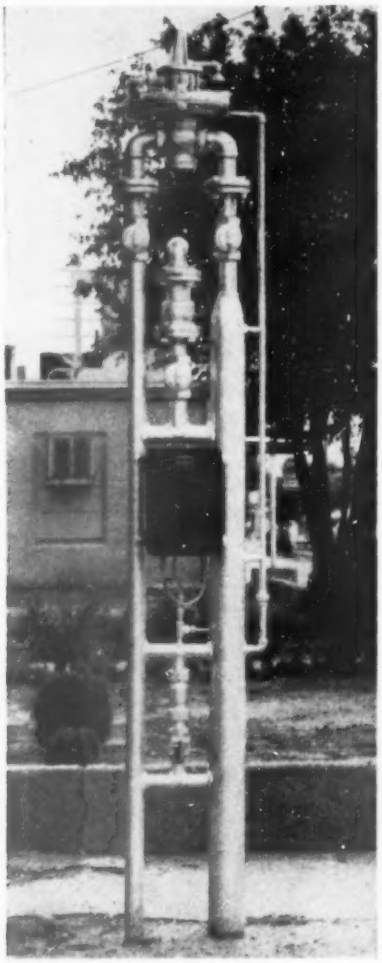
Three Firms Seek $23 Million In Wholesale Rate Increases

WASHINGTON. — Three transmission companies are seeking Federal Power Commission authority to raise yearly wholesale natural-gas rates a combined total of about $23,000,000.

Colorado Interstate Gas Co. is asking an increase of $6,508,000 in its rates, which will affect 12 utility customers in Colorado and New Mexico. Tennessee Gas Transmission Co. is requesting almost the same amount covering 40 of its customers in Kentucky, Louisiana, Massachusetts, Mississippi, New York, Ohio, Pennsylvania, Tennessee, and West Virginia.

The largest increase, $10,000,000 per year, is being sought by United Fuel Gas Co. of Charleston, W. Va., a Columbia Gas System, Inc., subsidiary. The company is seeking the new rate on a rehearing. Earlier the FPC shaved off approximately $3,000,000 from the amount requested.

All applicants desire the increases to be effective the first week in October.



One Way to Save Space

Lone Star Gas Co. breaks away from the usual method of spreading out natural-gas manifolds by building this one at Snyder, Tex., "totem-pole" style. On top is the regulator with the relief value underneath and the boxed meter on the bottom.

June Revenues Jump 26.9 Per Cent From Last Year

WASHINGTON.—The Federal Power Commission reports operating revenues of natural-gas companies were $158,282,795 in June, an increase of 26.9 per cent over the same month in 1952, but a decrease of $22,767,700 from last May.

During the year ending June 30, revenues totaled $2,163,962,625 a 20.9 per cent increase over the preceding 12-month period.

Sales to ultimate consumers reached 205,909,000,000 cu. ft. during the month, a jump of 16.7 per cent over June 1952. These sales to residential, commercial, and industrial consumers rose 8.1 per cent, 11 per cent, and 20.4 per cent, respectively. Revenues from all sales amounted to $66,425,690, a rise of 22.6 per cent.

June net income of the companies was $11,054,709, up 18.3 per cent from the preceding June. The 12-month net income ending last June was $203,009,838, a 9.4 per cent increase over the same period the previous year.

Natural Gasoline

White Flat Pool Operators May Build Cycling Plant

SWEETWATER, Tex. — Operators in the 30-well White Flat pool near here are discussing plans for construction of a cycling plant for conversion of waste gas from the field into natural gasoline, butane, propane, and fuel gas.

It is reported that tentative plans for the plant are similar to the ones being used to construct the $500,000 cycling plant in Rowan & Hope field west of here. When this latter plant is completed in early November it will process about 2,500,000 cu. ft. of wet gas daily.

Plant Expansion to Begin

ELK CITY, Okla.—Expansion of the Elk City natural-gas processing plant to double its present capacity is expected to get under way by October 1 with Fluor Corp., Ltd., installing the new units.

Fluor was awarded the expansion contract by Shell Oil Co., acting for 14 companies composing the unit.

The project calls for installation of six 1,760-hp. compessors, a 62-ft. absorption column and a 100-ft. fractionating column for stabilizing gasoline. The new units will increase the intake capacity to 225,000,000 cu. ft. of gas daily and the plant's production of natural gasoline, butane and propane will be increased 50 per cent.

Compressors in Operation

SHREVEPORT. — Compressors for cycling gas in the South Sarepta field, Bossier Parish, Louisiana, have been placed in operation by Sunray Oil Corp. The company is building a cycling plant in the 14-well field which was ordered shut-in last February by the state conservation commission.

Plans call for L.P.G. to be extracted from the wet gas with the dry gas being injected into the center of the field to maintain reservoir pressure. Withdrawals will be made from four outer wells which were drilled to establish the field's boundaries.

Skelly Expanding Plant

EUNICE, N. M. — Skelly Oil Co. has started its third expansion project on the company's No. 2 gasoline plant here.

The new facilities will increase the plant's intake by 20,000,000 cu. ft. of gas, and give it an added production of 1,430 bbl. of L.P.G. This gives the company a combined output of 6,190 bbl. in the area.

Construction is being handled by J. E. Carlson Corp. and is expected to be completed next April.

L.P.G. Storage Units Planned

WASHINGTON.—Phillips Petroleum Co. and Anchor Petroleum Co. have been granted certificates of necessity for the construction of L.P.G. storage units.

Phillips received a certificate for $249,600 for a new unit near Goddard, Kans. Anchor's certificate for $316,900 was for storage facilities in Hardin County, Texas.

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Among the Contractors Drilling

New Contracting Firm

Mustang Drilling Co. is a newly formed contracting firm with headquarters at Tulsa. Officers include Russell Cobb, Sr., chairman of the board; Russell Cobb, Jr., president; Dan Savage and Rodney Manning, vice presidents. The company is starting with one cable-tool rig, now working in Creek County, Oklahoma, but plans to provide additional cable-tool rigs as well as rotary equipment in the near future.

Butler-Johnson Service Corp., Shreveport, is drilling Union Oil Co.'s second test on the latter's large Hines Tie & Timber Co. holdings in northern Avoyelles Parish, eastern Louisiana. Location of the new wildcat operation, projected to 6,500 ft., is 2 miles southwest of Saline Lake field.

Woolf & Magee, Tyler, Tex., will drill a couple of 4,500-ft. Wilcox tests for Nebo Oil Co., Inc., of Dallas, on the latter's fee land in southeastern Caldwell Parish, eastern Louisiana. Location for the first, in 26-12n-5e, is 11 miles southeast of Columbia. The other will be a mile further southeast.

Barnwell Drilling Co., Shreveport, has a 3,500-ft. test under way for B. N. Tidwell, Winfield, La., at a wildcat location, 1 Humphries, 5¼ miles north of Summerville, in northern LaSalle Parish, northeastern Louisiana. Location, in 21-10n-3e, is about 1½ miles east of the Olla field.

Whitehurst Drilling Co. is drilling for Norton Oil Co., Inc., of Shreveport, at 2-C Madison, a 6,800-ft. wildcat test 2½ miles east of Monterey, in Concordia Parish, eastern Louisiana. Location is in 5-5n-8e, 5½ miles southeast of the Lismore Landing field, nearest production.

Milton Crow, Inc., Shreveport, has contracted for an 8,500-ft. Travis Peak test to be drilled for Natural Gas & Oil Corp. and associates at 1 Devereaux, in 16-17n-10w, 2½ miles northwest of Lake Bistineau, in the East Sligo area, Webster Parish, northern Louisiana.

Strahan & Lauderdale will do the drilling on the projected 7,000-ft. test which P. G. Lake, Inc., of Tyler, Tex., will drill at a wildcat location northwest of Claytonville, in western Fisher County, West Texas. Location is for 1 Hilburn, in 179-s-H&TC Survey.

Circle Drilling Co., Lake Charles, La., has a rig under contract to Austral Oil Exploration Co., Inc., of Houston, for a 10,500-ft. wildcat test in St. John

Day-tour crew on Loffland Brothers Co. rig which is drilling on Amerada Petroleum Corp.'s rank wildcat oil-discovery well in the Fryburg area, Billings County, North Dakota, in the Williston basin. Left to right: Joe R. Lowenstein and Emil L. Taraba, floormen; C. W. Shaw, motorman; Donald L. Boehming, derrickman; and J. W. Fregia, driller. Lee Pease, not shown, is tool pusher on the rig. The well, 1 Herman May, located in the C NW NE 9-139n-100w, flowed 392 bbl. of 40.1°-gravity oil on a 24-hour gage through 24/64-in. choke in production tests of a Madison zone at 9,402-66 ft. Deepened, it encountered promising gas showings in Ordovician-Winnipeg sand at 12,997-13,051 ft. At latest report it was coring ahead below 13,072 ft.

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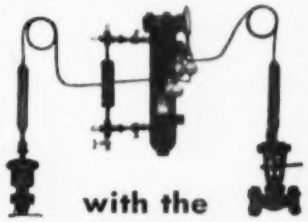

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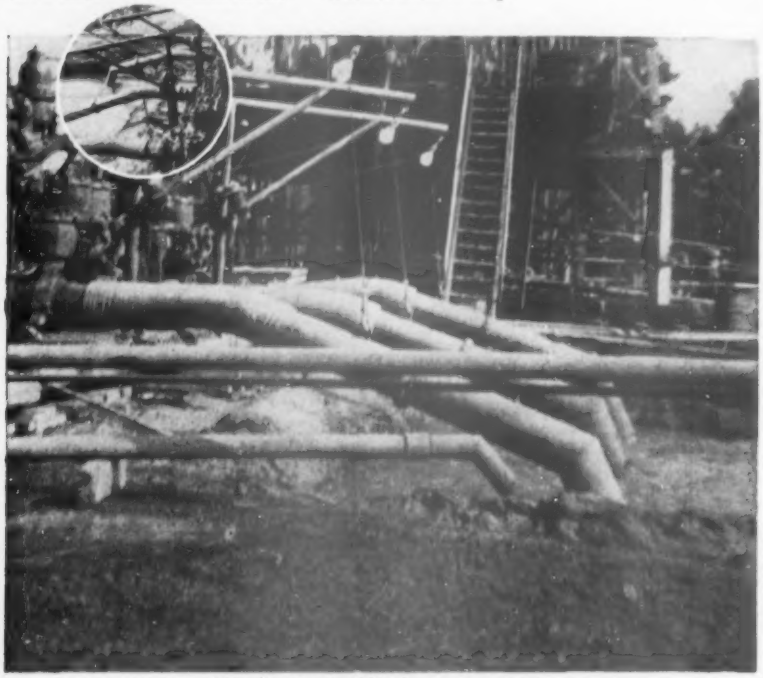

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the Baptist Parish, Louisiana Gulf Coast. Location is 3 miles north of Garyville at 1 Bourgere estate, in 20-11s-6e.

Tandem Drilling Co. is starting a 6,700-ft. Smackover test for Barron Kidd of Dallas at 1 Sowell, in 4-17s-16w, 2 miles northwest of Lisbon, Union County, Arkansas.

A. W. Drilling Co. has a new contract operation under way for Union Oil Co. and associates in Nolan County, West Central Texas. Location is a wildcat on the Evelyn Cox ranch, west of Lake Trammell, 12 miles southwest of Sweetwater. It is nearly 2 miles west of the South Lake Trammell field.

Crown Drilling Co. has turned over the development of its Jeppi-Camp lease at Edison, Calif., where it opened a new oil-producing area late last year, to Standard Oil Co. of California. It will continue active in the area as contractor on Standard's first well, 47-8 Jeppi-Camp, southwest of Crown's discovery well, No. 76-8, completed in the Pyramid Hills sand at 5,786-5,817 ft.

O. K. Smith Drilling Co. is contractor on 5,400-ft. wildcat test which Calvert & Manley are drilling at 1 Adams, in the Robert Adams Survey 6, 3 miles east of Alfred, in Jim Wells County, South Texas.

Earl West has contracted for another well which Arkansas Western Gas Co. of Fayetteville, Ark., will drill in new West Fork gas area in Washington County, northwestern Arkansas. The new well, 1 Dietrick, is located 2½ miles southeast of the field, opened last January and in which two wells have been completed from a shallow pay at 575 ft. It is projected to 1,000 ft.

ACTIVE ROTARY RIGS*

Area	Week ended 9-7-53	Change week ended 8-31-53	Change week ended 9-8-52
Gulf Coast	513	−18	+ 1
N. & W. Tex.-N. M.	819	+24	+ 95
Ark.-N. La.-E. Tex.	185	+ 2	+ 47
Oklahoma	357	−10	+ 46
Kansas-S. Nebraska	165	+10	+ 8
Illinois-Eastern	144	− 4	− 6
Rocky Mountains	273	+15	+ 13
Pacific Coast	176	+ 3	+ 21
Total U. S.	2,632	+22	+225
Western Canada	187	+14	+ 17
Total	2,819	+36	+242

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, and the Pacific Coast and Illinois-Eastern areas are shown on pages 203 and 204.

REFINING

Product Sales Report

Small companies got more business in year just ended

WASHINGTON. — Seventeen per cent of the total value of petroleum products purchased by the military during the fiscal year 1953, including offshore procurements, went to small firms, the Armed Services Petroleum Purchasing Agency reported last week.

Analysis of the $1,038,986,114 worth of products contracted for by ASPPA shows that $179,811,976 went to small businesses, which received 1,991 of the 3,421 contracts entered into. Small concerns got 52 per cent of the business placed under bids and 12 per cent of the negotiated volume.

The agency's study shows that contracts were awarded for $48,160,333 of greases, oils, and packaged products of which $20,144,448 or 42 per cent went to small firms; $630,046,197 of aviation fuels and storage with $75,800,678 or 12 per cent to small firms; $114,158,885 of shore and marine fuels with $58,212,023 or 51 per cent to small firms, and $246,620,699 of bulk fuels with $25,654,827 or 10 per cent to small concerns.

The proportion of business going to small firms was 4 per cent greater than in the fiscal year 1951. "It is ASPPA's belief that these small firms have made a noteworthy contribution to the successful operation of the military petroleum-supply system," the report stated.

Standard Plans World's First Fluid Catalytic Hydroformer

WHITING, Ind.—Standard Oil Co. (Ind.) plans to erect the world's first fluid catalytic Hydroforming unit at its 220,000-bbl. refinery here.

The 200-ft. unit will change 30,000 bbl. a day of low-octane naphtha into high octane hydroformate for blending with other gasoline stocks. The process improves the octane number of gasoline by exposing the gasoline fractions of crude oil to a special catalyst in the presence of hydrogen.

The unit will hold about 500 tons of a special molybdena type catalyst which is so powdery that it acts as a fluid. The catalyst reactor will be one of the heaviest vessels ever made for an oil-recovery process.

Construction will be started late this year by M. W. Kellogg Co. with completion expected to be late in 1954.

A.P.I. Group Plans Special Symposium for Annual Meet

NEW YORK.—An increased interest in new methods for measuring, sampling, and testing of crude-oil and products has prompted the American Petroleum Institute to schedule a special symposium on this subject for the thirty-fourth annual meeting for Chicago in November.

A special committee has been formed by the Committee on A.P.I. Code 25, to organize the session. In scope the symposium will embrace container calibration, gaging, metering, temperature determinations, sampling and testing methods, and instruments in both field and laboratory.

The special committee, numbering 25 members from all divisions of the industry, is headed by H. C. Packard of Shell Oil Co., New York. A. H. Newberg, of Service Pipe Line Co., Tulsa, is vice chairman, and E. O. Mattocks, of the A.P.I., is secretary.

Lube Specifications Revised

WASHINGTON.—A revised specification for the inspection, sampling, and testing of lubricants, liquid fuels, and related products has been issued by the General Service Administration.

The revised specification VV-L-791e, dated May 21, 1953, supersedes VV-L-791d, issued June 20, 1950, "Lubricants, Liquid Fuels, and Related Products; Methods of Inspection, Sampling, and Testing." It is applicable to all purchases by the federal Government, military as well as civilian.

The new specification contains an index for comparison with the previous edition, indicating where methods have been added, revised, canceled, or left unchanged.

Copies of the specification may be secured at $2 each from the General Services Administration, Business Service Center, Region 3, Seventh and D Streets, S.W., Washington 25, D. C.

Hancock Adding Two Units

LONG BEACH, Calif. — Hancock Oil Co. will add a 4,200-bbl. Thermofor catalytic cracking unit at its 12,500-bbl.-per-day refinery here. Also included in the company's plans is a 1,200-bbl.-per-day polymerization unit.

The modernization program, which will give Hancock its first cat cracker, is covered by a certificate of necessity

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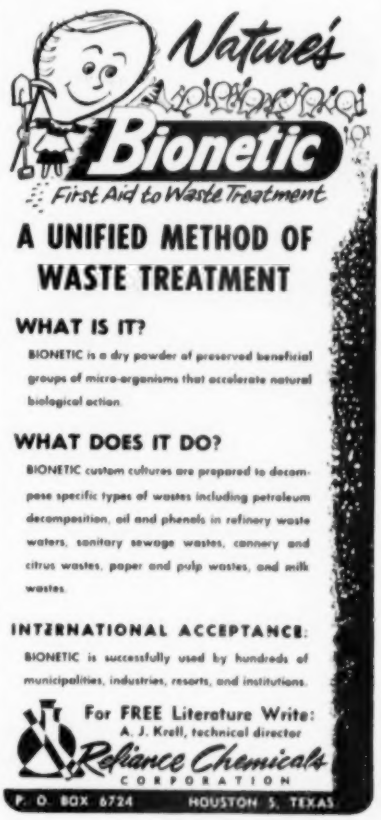
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Refining Briefs

CHARLESTON, S. C.—A million-dollar plant for canning lubricating oils will be built by Esso Standard Oil Co. on a site adjacent to the 8,000-bbl.-per-day asphalt refinery here. The new plant will have an annual throughput of 235,000 bbl. of finished products to be shipped in from other Esso refineries for distribution in the Southeast. Construction is due to begin in October.

NEW YORK.—About 1.7 billion quarts of canned motor oil will be consumed this year by American motorists, according to an estimate made by L. G. Kannells of Continental Can Co.'s metal division. Due to the steadily increasing number of cars on the road, this 1953 estimate represents a volume of approximately 100,000 qt. over 1952 canned oil consumption. It is double the 1940 market.

Petrochemicals

Esso Orders First Gas Turbine for Petrochems

BATON ROUGE.—Esso Standard Oil Co. has contracted for the installation of a 5,700 hp. General Electric gas turbine to drive a 16-stage Ingersoll-Rand centrifugal compressor.

The unit will boost light hydrocarbon gases from atmospheric to about 285 psig. Speed of the turbine will be controlled at 6,400 r.p.m. by a pneumatic controller actuating a fuel feed valve for a set compressor suction pressure.

Witco Buys West Coast Plant

NEW YORK.—Witco Chemical Co. here has announced the acquisition of new plant facilities in the Los Angeles area, where manufacturing equipment will be established in the near future. The move was designed to bring the company's production operations closer to the growing West Coast market for Witco products.

Witco figures prominently in the manufacture of a line of napthenates from petroleum-derived naphthenic acids, and it is understood that the new Los Angeles operations may include production of this petrochemical.

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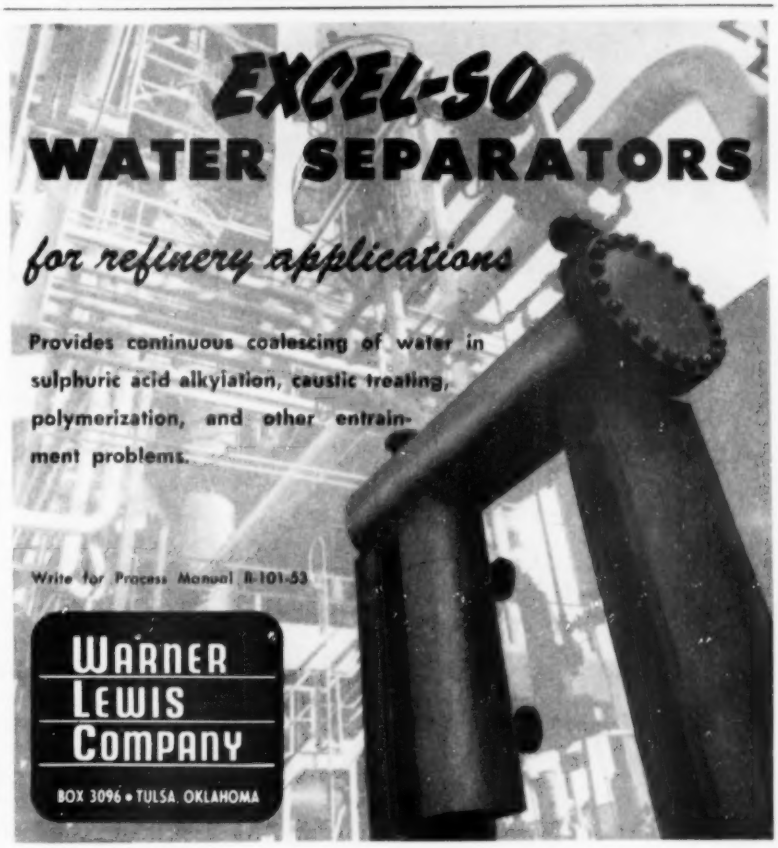
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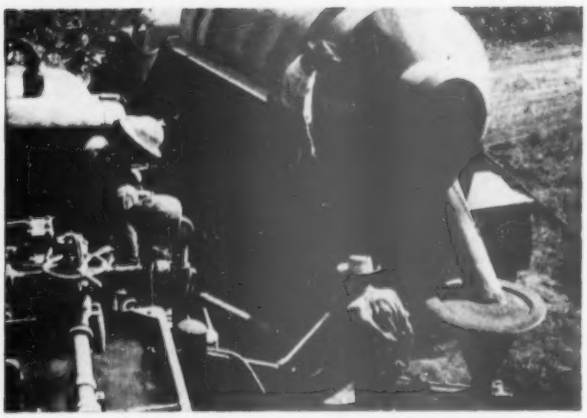

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EXPLORATION

Jurassic Oil Found in Gas Basin

by Philip C. Ingalls

THE San Juan basin of northwestern New Mexico, now principally noted for its vast area of stratigraphically trapped gas in a wedge of Upper Cretaceous rocks, is due for increased interest in the oil potentialities of the area's older folded rocks.

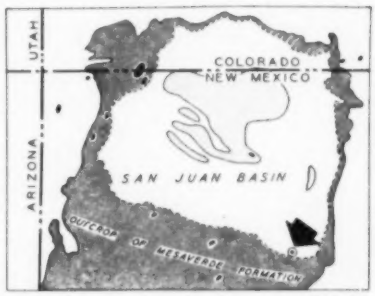
Magnolia Petroleum Co. 1 Hutchinson-Federal, NW SW 14-19n-3w, Sandoval County, is drilling ahead for granite after recovering water-free, 35°-gravity oil from the Jurassic-Entrada sandstone at 5,200 ft. The nearest Entrada oil production is at Wilson Creek field, Rio Blanco County, Northwest Colorado.

Magnolia's wildcat, located in a 7,000-acre unitized block on an anticlinal nosing in surface Cretaceous rocks, found fresh water in the Dakota. In the Entrada, however, a drill-stem test at 5,200-19 ft. recovered 180 ft. of free oil in 1½ hours and another, at 5,219-29 ft., recovered 510 ft. of free oil in 2 hours.

Continued hole making indicated an oil column of 44 ft. and a total thickness for the Entrada about the same as at the nearest outcrop where it is 190 ft. It is reported that the recovered oil has a high pour point and other characteristics which resemble the crudes of the lacustrine deposits of the Green River and Wasatch of the Uinta basin. The shut-in pressure of 2,420 psi. indicates a hydrostatic head reaching the outcrop area 20 miles to the southwest in the Nacimiento Mountains. The wildcat, now cased to 5,400 ft. and drilling below 6,700 ft., recovered fresh water on a drill-stem test at about 5,500 ft.

There have been very few tests of pre-Cretaceous rocks in or at the edges of the San Juan basin. Shows of oil have been reported in the Entrada by two of these wells, but no tests of the formation had been made prior to those by Magnolia.

The Entrada in the locality of Magnolia's wildcat is a red-bed sequence, probably of nonmarine origin. Thus, not only has the well indicated production in a formation that has been nonproductive throughout the southern Rocky Mountain area, but appears to have shattered one more geologic prejudice.



Arrow points to indicated Jurassic-Entrada discovery. Light shading in center of basin is the proved area of Upper Cretaceous gas.

Jurassic rocks (principally the marine Sundance and Morrison) are productive in the Rocky Mountain area, but, with the exception of a few Nugget sand wells in Wyoming, there is probably no commercial production from nonmarine Jurassic rocks. The oil found in the Entrada at Magnolia's wildcat is believed to have originated in the immediately overlying Todilto, a highly fetid limestone ranging from 0 to 40 ft. in thickness and locally overlain by gypsum reaching 80 ft. in thickness.

There was little Lower Cretaceous deposition in the San Juan basin and parts of the sequence of Jurassic rocks were cut away during this time. Pre-Cretaceous structures involving Jurassic rocks but hardly affecting Cretaceous rocks are known, especially near the south edge of the basin along the flank of the Zuni uplift.

Extensive seismograph work in the basin during the past 8 years has revealed little structure involving the Dakota. On the other hand, the Jurassic-Todilto limestone, approximately 800 ft. below the Dakota and a rather consistently identifiable pick on shooting records, has been reported as revealing a number of structures. Nearly all holes dug on Todilto shot pictures, however, have been bottomed in the "structureless" Dakota.

Though off the beaten path of most operators, Magnolia's wildcat indicates that the southern hogback area of the San Juan basin will bear watching in the immediate future.

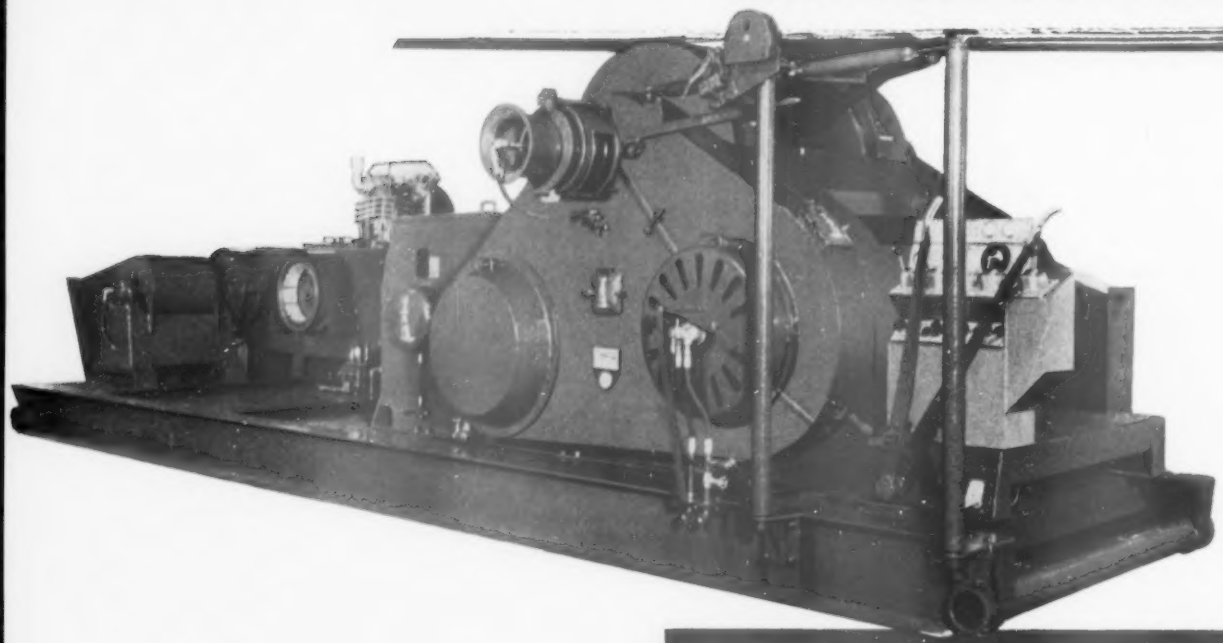
HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS . . . Phillips Petroleum Co. 1-VV University, outpost to a Devonian discovery in northeastern Andrews County, flowed 512 bbl. of oil in 16 hours through ¼-in. choke on a drill-stem test of the Ellenburger. The Ellenburger had been perforated from 13,813-49 ft. It also flowed at the rate of 86 bbl. in 1 hour on test of the Devonian, and will be dually completed.

OKLAHOMA . . . Centrahoma pool in Coal County, southeastern Oklahoma, will get its second Oil Creek sand test at W. A. Delaney, Jr. 2 Cody-Jordan, a 7,000-ft. well in C SW SW 26-2n-9e. It is located 1 mile east of Twin Oil Corp. 1 Cody, C SW SW 27-2n-9e, Oil Creek sand oil discovery. The well flowed 403 bbl. of oil in 19 hours on various chokes from perforations at 6,882-92 ft. The main pay zone in Centrahoma pool is the Cromwell sand at near 5,000 ft.

COLORADO . . . National Drilling Co. pumped at the rate of 100 bbl. of oil per day on test at 1-2 Hough, NE NW NW 12-2s-57w, wildcat west of Little Beaver field in Adams County. Lion Oil Co. 3 Flessner, NW SE SE 19-1s-56w, ½-mile north extension to Little Beaver field, flowed 1,104 bbl. of oil per day through ¾-in. choke. Bill Tomberlin reported a flow estimated at 250 to 300 bbl. of oil hourly from 3 Hogsett, south of the Lion extension.

INTRODUCING....



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New — BIGGER DRUM
(Longer drum length and larger spool diameter)

New — HEAVIER COMPOUNDING TRANSMISSION

New — AIR-CONTROLLED HIGH AND LOW FRICTION CLUTCHES

New — LARGER CAPACITY BRAKES

New — OPTIONAL DOUBLE PUMP DRIVE
(For simplified stand-by pump operation)

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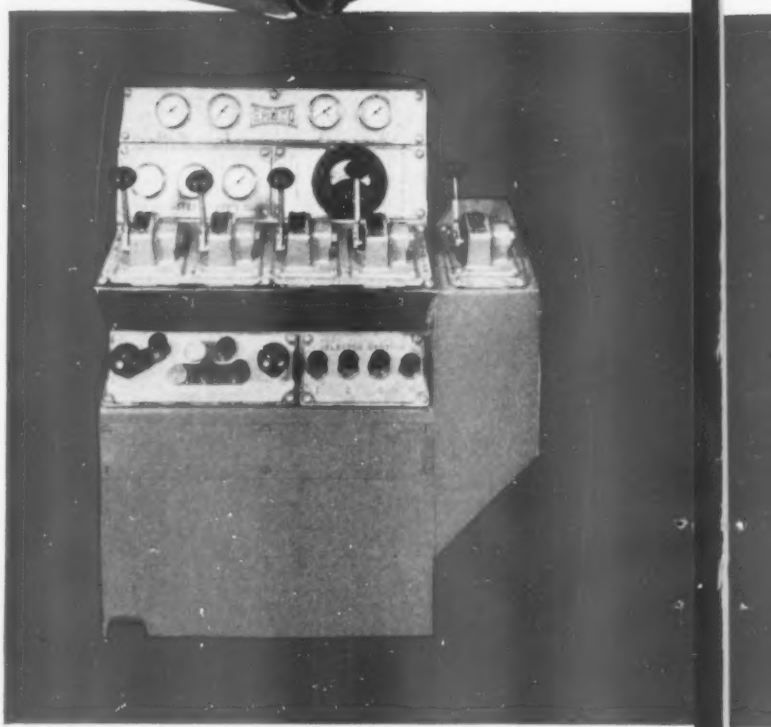
The high and low drum friction clutches, as well as all other friction clutches of the GC-500, are located on the outboard ends of the shafts for faster, easier servicing. The new rig is the sturdiest, smoothest running "500" rig produced by Emsco. It is available with fluid or mechanical power drives.



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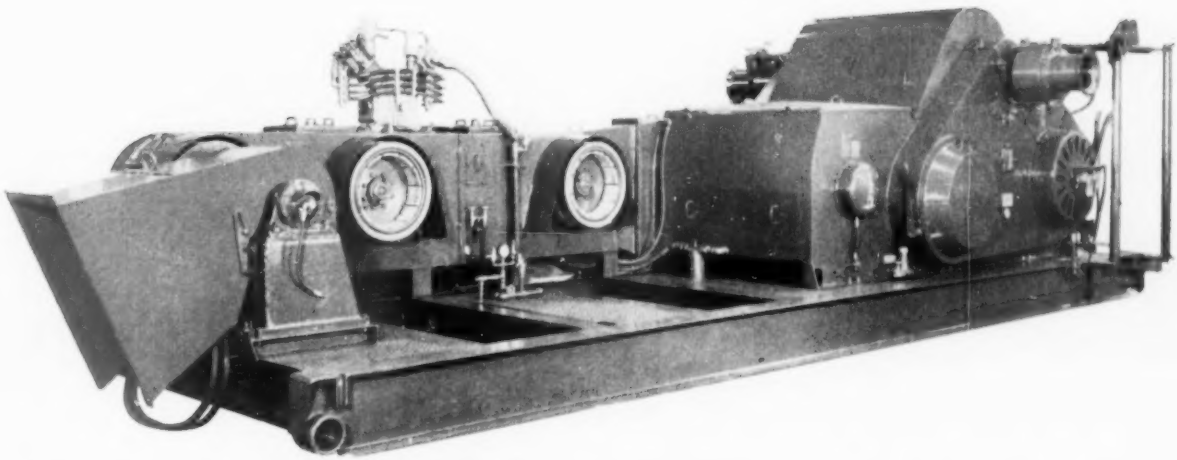

CHOICE OF ENGINES AND CHOICE OF COMPOUNDING TRANSMISSIONS

No. 52 Compounding Transmission

No. 53 Compounding Transmission

The heavier compounding transmission of the GC-500 provides maximum flexibility in the types of engines used. For instance, with the new transmission it is now possible to use two engines each with a 300 h.p. rating at 900 to 1200 r.p.m., or three engines each with a 200 h.p. rating at 900 to 1200 r.p.m.

This permits the operator a wide selection in the engines used, and assures that adequate horsepower will be available to meet his hoisting and pumping requirements.

SPECIAL FEATURES OF NEW GC-500

- Chains and bearings of the drawworks, selective speed and compounding transmissions are lubricated by an automotive-type pressure lubrication system. This eliminates costly "oil up" downtime.
- All drawworks friction clutches are located on the outboard ends of shafts.
- Clean design permits the entire unit to be cradled into the substructure.
- Rig is available with two or three-engine compounding transmission.
- Removing and installing engines is made simple and fast.
- Emsco auxiliary brake package, dynamatic or hydromatic, is optional.
- Optional auxiliary drives are provided for generator, washdown pump, etc.
- Built-in sand reel is optional.

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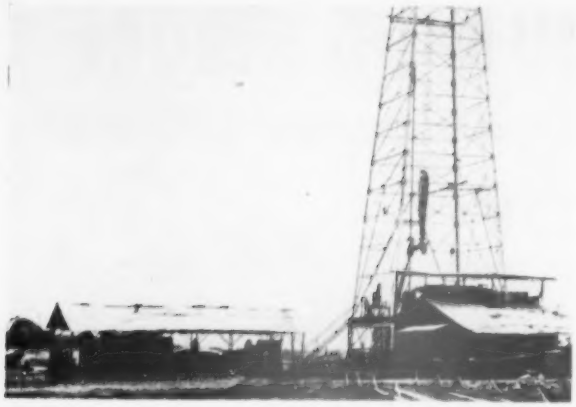
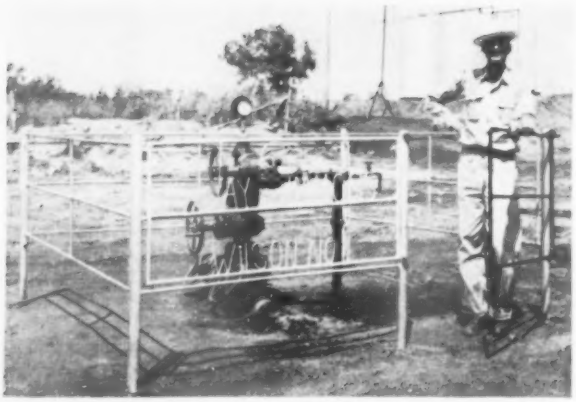


Jay Simmons 1 Kidwell, C NE NE 23-8n-4w, offset to the North Freeny pool discovery well, Simmons 1 Wilson. The 1 Kidwell is the latest addition to North Freeny pool production.



Jay Simmons 1 Wilson, discovery well of North Freeny pool. The discovery well was completed in April with an initial production of 411 bbl. of oil per day from the Tulip Creek sand at 10,447-488 ft.

Rotaries Turn at Record Rate in Oklahoma

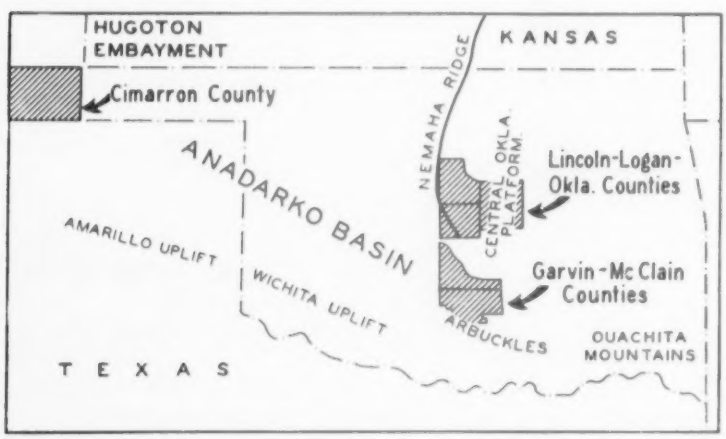
Wildcats will be up 15 per cent, development wells 23 per cent in '53 over '52

by John C. McCaslin

DRILLING in Oklahoma is soaring to new record highs this year. Total completions in the state as of September 1 were 4,878, up 24 per cent over last year. The Journal has forecast a 24 per cent gain in completions over 1952 with operators to final 7,177 wells in the state. More than 25 million feet of hole will be dug to make this record, compared to 21,600,000 ft. in 1952.

Operators plan to complete 840 wildcat wells in the state this year, up 15 per cent over last year's total. Development wells are expected to finish the year with a 23 per cent gain over last year, with more than 6,300 field wells slated for completion.

Wildcatting in the state this year has resulted in significant discoveries, particularly in (1) the Central area (Logan-Lincoln-Oklahoma counties), (2) the southwestern area (Garvin - McClain counties), and (3) the Panhandle (Cimarron County). Central Oklahoma counties have consistently been the most active areas in the state this year in both exploratory and development projects. Lincoln County has led this area in wildcat and field activity. The new Springer sand trend west of the Golden Trend in Garvin County, southwestern Oklahoma, has been that section's bright spot. Deep North Freeny pool in McClain County has undergone a rapid expansion program. Important gas-reserve development in the Oklahoma Panhandle has highlighted activity in the Hugoton embayment of the Anadarko basin this year.



Map of Oklahoma showing regional geologic features and areas of 1953's most significant developments.

Central Oklahoma . . . This portion of Oklahoma, which includes Lincoln, Logan, and Oklahoma counties, has scored 21 new oil and gas discoveries this year. It is an old producing area, containing two of the state's best known oil fields, Oklahoma City and West Edmond. The three-county area lies to the east of the Nemaha ridge on the Central Oklahoma platform. This platform runs north from the Pauls Valley uplift to the Kansas border.

Lincoln County, one of the state's most heavily drilled areas, has been actively prospected for more than 30 years. The continued success of the area is attributable to the existence of many prolific producing sands and the complexities of their traps.

The county's most active development area is Kendrick and Northwest Kendrick pools. Kendrick pool was opened in April by Foster Drilling Co. for an initial production of 240 bbl. of oil per day from the Oswego lime at 3,282-92 ft. The discovery well, 1 Josephine, is located in SW SW SW 3-15n-5e. Northwest Kendrick pool was opened in January at W. A. Barton 1 Hartwell, SW SW NW 5-15n-5e, flowing 180 bbl. of oil per day from the Prue sand at 3,525 ft. The area between the two pools is rapidly being filled in north and northwest of the

town of Kendrick. There are 12 active operations in this area.

Recently the westernmost well in Kendrick pool flowed 672 bbl. of oil in 5 hours and 40 minutes through ¾-in. choke from the Oswego lime, making it one of the best wells in the area. All wells in Kendrick pools have reported high flow potentials. Activity is expanding throughout the north half of Township 15n-5e, as evaluation of the Oswego lime reservoir gains momentum.

East Payson field, opened in April 1952, is another highly active area in Lincoln County. The discovery well, Gulf Oil Corp. 1 Henthorn estate, 1-12n-4e, flowed 195 bbl. of oil and 1,000 M.c.f. of gas per day from the Skinner sand. There are six active operations in the area at the present time. The field has more than 60 producers. Daily allowable is 100 bbl. per well.

The general Logan-Oklahoma county area has experienced a number of leasing and drilling campaigns over a period of years. Although the fields have been very prolific, the structural complexities characteristic of these anticlines have resulted in a large number of dry holes. Nemaha ridge structures have long been among the most prolific oil producers in the Mid-Continent area. Production records show the Wilcox sand, which is the most prolific producer in the area, is capable of producing from 600 to 1,000 bbl. per acre foot.

Southwest Navina pool, opened last winter in the heart of a dry-hole area of Logan County by Macmillan Petroleum Corp. et al., is one of the most significant discoveries of 1953. The field, located about halfway between Crescent and Edmond fields, now has five producing wells. The discovery well, the 1 Krout, flowed at the rate of 1,200 bbl. per day on 24/64-in. choke from the second Wilcox sand. The well drilled from Pennsylvanian strata into Sylvan shale to establish the presence of a sharp elongate faulted anticline, similar to the Crescent anticline, one of the area's most prolific producers. Subsequent wells in the pool have been completed in the Layton sand and Simpson dolomite.

Oklahoma County's most significant discovery this year was at Northwest Edmond, opened last winter at Calvert Drilling Co. and Huffman & Malloy et al. 1 Salisbury, 4 miles north of the city of Edmond. The gas-distillate discovery has both second Wilcox sand and Simpson dolomite production.

Recently an oil producer was completed east of the fault on the east flank of Oklahoma City field by Jay Simmons. The well flowed 140 bbl. of oil per day through 12/64-in. choke from perforations in the Pennsylvanian unconformity sand at 6,535 ft. Simmons also completed a Hunton lime oil well to the north, also east of the fault. Interest in this area just east of Oklahoma City field on the downthrown side of the fault was revived last year when R. W. Hibbert completed the discovery well of Southeast Oklahoma City field for 96 bbl. of distillate and 35,000 M.c.f. of gas daily from the basal Pennsylvanian unconformity sand. Oil was also found at another well by Simmons in the unconformity sands at about the same depth as the Wilcox on the west side of the fault in Oklahoma City field proper.

Southwestern Oklahoma . . . McClain County in southwestern Oklahoma has scored five new strikes this year. The most significant discovery is deep North Freeny pool in Township 8n-4w, which currently has seven active operations under way. The discovery well of North Freeny pool was Jay Simmons et al. 1 Wilson, 14-8n-4w. Initial production was 411 bbl. of oil per day from the Tulip Creek. A south offset was recently added to the pool with deep gas-distillate production in the second Bromide sand. Freeny pool was opened a short time before North Freeny at K. A. Ellison 1 Tankersly, 25-8n-4w, which was completed for an initial flow of 125 bbl. of oil per day from the Bromide sand. Both fields have been rapidly developed.

The second well in new Northwest Lindsay pool was recently completed at Sinclair Oil & Gas Co. 1 Nuckols Unit, 15-5n-4w. The well flowed 163 bbl. of oil in 4 hours through 27/64-in. choke from deep first Bromide sand perforations. The discovery well, Sinclair 1 Community Smith, was finaled last year in 17-5n-4w, for 1,463 bbl. of oil per day from the McLish sand.

Garvin County's Northeast Purdy Springer sand area has been one of Oklahoma's high-interest spots this year. The pool was opened late in 1952 at Magnolia Petroleum Co. 1 Duncan in 1-3n-4w, for an initial production of 566 bbl. of oil per day from the Springer sand. There are eight active operations in the field currently. Cities Service Oil Co. and Superior Oil Co. are completing a ¼-mile extension to the pool, which produces from both the Springer sand and the shallower Hart sand. The Hart sand discovery well was Superior 1 Arner in 7-3n-3w. The latest Cities Service well is the company's eleventh well in the new Springer sand trend. Cities Service has five wells under way in the area.

This new Springer sand trend lies on the eastern rim of the Anadarko basin just west of the Golden Trend. Production in the Golden Trend fields is from the Pennsylvanian Deese sand and the Ordovician Simpson series. No Springer is found in these fields.

An active program of connecting the area between the Purdy pools and the Golden Trend has been under way in recent months with good prospects of success. Development of the Purdy areas has been characterized by high-volume producers and good outpost success. Hart sand production has been established between the Purdy areas and the Golden Trend, and drilling for this sand is active off the north flank of the Purdy pools and west flanks of Golden Trend production.

Oklahoma Panhandle . . . The far northwestern extension of Oklahoma is one of the most active areas in the Hugoton embayment of southwestern Kansas and northwestern Oklahoma. Continued drilling is rapidly enlarging the new Keyes (basal Morrow) sand gas field of northeastern Cimarron County where 14 active operations are under way.

This gas area, designated as North Sturgis and Sturgis pools, was opened last winter at Coltexo Corp. 1 Purdy in 20-6n-9eCM. Keyes sand gas wells now extend through the full lengths of Townships 5n-9eCM and 6n-9eCM. Cities Service recently completed five gas wells in the area with flows gaging from 8,150 to 33,850 M.c.f. per day. There have been 13 gas wells completed this year in the area. This new gas reserve lies about 15 miles west of the western flank of the vast Hugoton field.

A READER COMMENTS

What's the Source of Uinta's Gilsonite?

Ardmore, Oklahoma

Congratulations on your issue of August 31 featuring Rocky Mountain oil basins. I am particularly interested in your remarks concerning the Uinta basin.

I was first attracted to the eastern side of the Uinta basin because it contains the greatest deposits of gilsonite in the world. I note you state that "the much-publicized oil shales of the area were the source of the abundant gilsonite veins in the eastern and central parts of the Uinta basin."

Johnson and Bunn 2 Watson, on the large faulted Hell's Hole structure, just southwest of Rangely field, drilled to a depth of 9,500 ft. This well, which stopped just above the Entrada, encountered gilsonite in various fractured zones.

In the wildcat well we drilled just north of Ashley Valley field we found thick, waxy oil in fractured cores of the Phosphoria. After short exposure this oil solidified like gilsonite and may be seen on display in our office at Vernal, Utah.

I agree with your conclusion that, in an area that has two prolific Weber sand fields like Rangely and Ashley Valley, there are bound to be found more important Weber sand fields only awaiting the drill.

Roy M. Johnson

OKLAHOMA

Production Tests Get Under Way at Coal Strike

Production tests are in progress at one of the best wells in southeastern Oklahoma's history, the Twin Oil Corp. 1 Cody, geological test in Centrahoma pool, Coal County.

The discovery, C SW SW 27-2n-9e, is flowing on test after fracture treatment, tanking 403 bbl. of oil in 19 hours on various size chokes. Production is from the Oil Creek sand perforations at 6,882-92 ft. The strike opens Oil Creek production in this area.

Previously the well has flowed at 6,846-61, 6,860-79, and 6,902-49 ft. with flows ranging up to 40 bbl. per hour.

Link Wildcat Has Success in Osage

Kewanee Oil Co. of Tulsa has an indicated pool opener between rapidly expanding Northeast Little Chief pool and Northwest Naval Reserve pool in Osage County.

The 1 Osage, NW NW NW 19-25n-7e, is at total depth 2,868 ft., still in sand, but a slight shale break was shown at 2,859-61 ft. Seven-in. casing is set at 2,830 ft. Log and samples indicate the Burbank sand at 2,837-68 ft. as being typical oil sand.

On the south edge of Northeast Little Chief pool Sunray Oil Corp. is finaling 6 Osage, NE SE NW 12-25n-6e. The pool well flowed 260 bbl. of oil in 13 hours on 20/64-in. choke following fracture. The 7 Osage SE SE NW Section 12, is near the pay zone. South offset to the 7 Osage, Oliphant 1 Osage, NE NE SW 12, is drilling near 2,200 ft. Northeast Little Chief may possibly connect with Kewanee's indicated strike. Recent drilling in the pool has been parallel to South Burbank pool. The Kewanee well is likely to swing the drilling southeast. Northeast Little Chief pool is 3½ miles long, north to south.

Operator Drills Ahead At Grady County Strike

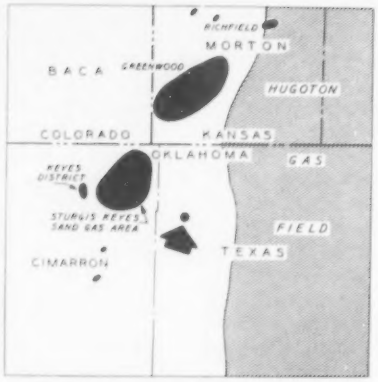
Phillips Petroleum Co. is drilling ahead at 1 Lack, eastern Grady County wildcat in the C SW SE 35-5n-5w after opening Springer sand production. The well is located on the west side of the Golden Trend which has no Springer production due to Springer pinchout. Recovery on a drill-stem test at 9,362-95 ft. was 35 ft. of 57.2°-gravity distillate. A drill-stem test at 9,410-60 ft. recovered 260 ft. of 41.2°-gravity oil and 15 ft. of mud. The Phillips strike is 2½ miles northwest of Southeast Bradley, a deep pool.

More Bromide Pay Tested At Garvin County Strike

Magnolia Petroleum Co. has tested more Bromide sand pay at 1 Allison, NW SW NW 22-4n-2w, Garvin County discovery.

The well flowed gas in 4 minutes and oil in 12 minutes on drill-stem test at 6,432-47 ft. Tanks took 27 bbl. in 1 hour. Recovery on the test was 3,500 ft. of oil. On previous tests the discovery flowed 20 bbl. of oil per hour from the first Bromide sand.

West of the Golden Trend in the new Springer sand producing area at Northeast Purdy, Superior Oil Co. 2 Alliance Trust unit, C NW NE 1-3n-4w, flowed 152 bbl. of oil in 22½ hours on 12/64-in. choke from the Springer. Magnolia 1 Victoria unit, C SW NW 6-3n-3w, flowed 509 bbl. of oil per day from the Springer on 32/64-in. choke. The Hart sand, the other producer in the field, will also be tested. Magnolia 1 Duncan Alliance unit, C NE NE -3n-4w, flowed 815 bbl. of oil per day on 32/64-in. choke from the Springer. Operator is testing the Hart sand. Another excellent test was reported at Magnolia 1 Duncan Neil unit, NW NE SW 7-3n-3w, which flowed 638 bbl. of oil per day on 24/64-in. choke from the Springer, also.



First oil production in Texas County in the Oklahoma Panhandle is reported at United Producing Co. 1 Kelly, C SE NE 2-4n-10eCM. (Arrowed on map). Swabbing netted 84 bbl. of 37°-gravity oil per day from perforations at 4,411-26 ft. in the Morrow sand. The significant discovery lies 4 miles east of Cimarron County's new Sturgis Keyes sand (lower Morrow) gas area, and about 8 miles west of nearest Hugoton production. The Texas County oil discovery is located in an area of intense interest. Nearby are located the two most active gas development areas in the Hugoton embayment, Greenwood pool (Morrow and Topeka production) in Morton County, Kansas, and the Sturgis Keyes sand gas area in Cimarron County, Oklahoma. Morrow production was recently extended 1 mile west at Richfield pool in Morton County.

Success Seen for Lincoln Confirmation

A good Prue sand oil pay is indicated at Puckett Drilling Co. 2 Harlow, NW NW NW 34-14n-6e, Lincoln County confirmation well to the new producing area between West Peck and Peck pools.

The indicated success is the north offset to the discovery well of the new area, Puckett 1 Harlow. The discovery well flowed 62 bbl. of oil hourly following fracture on initial test in the Prue sand. West Peck pool also has Prue sand production, while Pack pool has Wilcox pay.

KENTUCKY

EASTERN KENTUCKY

In Morgan County and located on Lower Sandlick Creek 14 miles east of the county seat of West Liberty, Van Everman et al have a dry hole at 1 E. Legg a wildcat in the eastern part of the county. Objective Weir (Mississippian) sand was topped at 802 ft. with no shows. Well was carried to the Berea sand topped at 886 ft. Total depth was 948 ft.

Same operator has moved ½ mile west from above failure and at 1 Young has topped Stray Weir at 790 ft. with good show of oil. Drilling is currently under way at 800 ft.

ROCKY MOUNTAIN

MONTANA

West Richey Area Wildcat Logs Mississippian Show

R. V. and T. F. Hodge recovered some free oil and heavily oil and gas-cut mud of test of Mission Canyon zones at 1 Eggebracht, C SW SE 3-23n-49e, in the West Richey area of McCone County. Tool was open for 2 hours in the interval 7,048-88 ft., and recovered was 90 ft. of gas, 180 ft. of heavily oil and gas-cut mud, 180 ft. of heavily gas-cut mud, and an unstated amount of free oil. Flowing pressure was 125 psi. A second test from 7,047-89 ft. recovered 240 ft. of gas, 210 ft. of gassy mud with a trace of oil, and 30 ft. of heavily oil and gas-cut mud under flowing pressure of 110-160 psi. Top of Mission Canyon was logged at 7,001 ft. and the operator is reported coring below 7,232 ft.

Meanwhile, Skelly Oil Co. has temporarily abandoned 1 Beery, C SW NE 22-23n-49e, also in the West Richey area. The failure is a northeast offset to the West Richey discovery, 1 Shock, SW NE SW 22-23n-49e, by Regent Drilling Co. The discovery flowed 132 bbl. of oil per day through perforations in the zone 7,056-88 ft., in Mission Canyon.

Sheridan County Wildcat Dry

Zach Brooks has abandoned 1 Larson, C NW SW 2-32n-55e, in Sheridan County, with the wildcat at 8,760 ft., total depth. Top of Mission Canyon was reported at 7,450 ft. A number of tests were run, but details have not been released. The well was drilled as a tight hole. Reports of shows in Mission Canyon which found circulation in Montana oil centers were not confirmed by the operator. The wildcat is 25 miles northeast of East Poplar field.

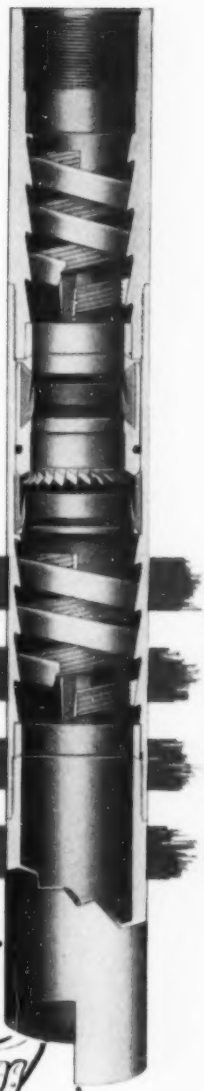
Carter County Wildcat Reports No Further Shows

Carter Oil Co. is coring at 9,284 ft. at 1 Traweek, C NE NE 6-2n-61e, in the Webster area of Carter County, with no new shows reported. The operator recovered 630 ft. of oil and 3,960 ft. of oil and gas-cut salt water on test of the Red River zone 9,057-75 ft. Later tests were failures. The wildcat is south of production in the Little Beaver field, Fallon County, and is west of the southern end of the Cedar Creek anticline.

NORTH DAKOTA

Fryburg Area Wildcat Has Deep Gas Shows

Amerada Petroleum Corp. recovered gas shows in drill-stem test of the zone 12,997-13,051 ft. at 1 May, C NW NE 9-139n-100w, Billings County. The wildcat is a discovery in Madison zones at about 9,000 ft. Test of the interval cited above recovered a 5,000 ft. water cushion cut with gas, and 140 ft. of slightly was-cut mud. Core from 12,946-13,004 ft. had slight stain and good porosity in sandstone of the bottom 1½ ft. Winnipeg



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TO ENGAGE THE FISH you need only connect the Bowen Overshot to the fishing string and run in to the top of the fish. At this point, rotate right and let down until the fish enters the Overshot. For jagged ends of pipe, rotate slowly to the right as you gradually lower the fishing string. This allows the cutters to mill the jagged ends of the fish for full positive engagement and better seal when circulating. Once the Overshot is settled securely over the fish, neutralize the torque and pull up on the fishing string.
TO RELEASE FROM THE FISH drop the weight of the fishing string heavily against the Overshot. Then at the same time lift and rotate the fishing string to the right. This expands the spiralling grapple and permits easy pull-away from the fish.
TO CIRCULATE AND ROTATE when the fish does not come free on a straight pull, start circulation and while maintaining an upward pull, rotate *violently* as much as the fishing string will stand. The Bowen Releasing and Circulating Overshot is ruggedly built to withstand the toughest fishing jobs!

AND HERE'S THE REASON WHY

When a Bowen Releasing and Circulating Overshot is rotated to the right and lowered over the fish, drag of the fish against the bore of the grapple causes it to unwind and expand sufficiently to allow the fish to enter. As upward pull is exerted, the spiralling grapple is contracted by the tapers in the bowl to wedge and set the deep cut wickers about the entire circumference of the fish. The pipe grapple or the tool joint grapple grips firmly and evenly over a large area of the fish in much the same manner that the "Chinese Handcuff," illustrated at right, tightens when pull is exerted. As pull is increased, the grapple tightens about the fish and the greater the pull, the tighter the grip *without distortion* to the fish!

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sand was topped at 12,915 ft. and the operator is coring at 13,072 ft.

COLORADO

Adams County Discovery Tested

National Drilling Co. gaged 100 bbl. of oil per day on pump from "J" sand at 1-2 Hough, NE NW NW 12-2s-57w, Adams County, for another discovery in the general Little Beaver area. The wildcat is a little more than 1 mile west of previous Little Beaver production. Production was from perforations 5,272-74 ft. and 5,280-88 ft.

Little Beaver Extensions Report Good Initials

Lion Oil Co. reported a 24-hour flow of 1,104 bbl. of oil through ¾-in. choke at 3 Flessner, NW SE SE 19-1s-56w, ½ mile north extension of production in the Little Beaver area, Washington County. Completion was in the zone 5,401-11 ft. Bill Tomberlin has run initial tests of 3 Hogsett, NW NE NW 30-1s-56w, south of the Lion well. The operator reported an estimated flow of 250-300 bbl. of oil per hour. Completion in this well was in the zone 5,409-30 ft.

WYOMING

South Sand Draw Discovery Nears Completion

Sohio Petroleum Co. has run successful drill-stem tests of Tensleep at 1 Unit, SE NW SE 36-32n-95w in the South Sand Draw area of Fremont County, and is preparing to swab perforations in that formation. Test through perforations 8,614-16 ft. recovered 7,239 ft. of oil and 187 ft. of drilling mud in 6 hours. The interval 8,600-14 ft. has now been perforated for testing.

The wildcat showed for commercial production several days ago, with indications of commercial oil possibilities also logged on tests of Phosphoria. Sand Draw field produces from both Phosphoria and Tensleep, and produces gas from Frontier. The South Sand Draw well made 3 to 5 million cu. ft. of gas per day from Frontier sands, but no plans for further testing of either Frontier or Phosphoria have been indicated by the operator.

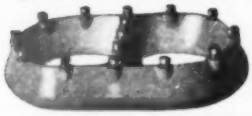
Weston County Discovery Completed

Irving Pasternak, Denver independent has completed 1-B Johnson, C NW SW 13-44n-65w, in the Wild Horse Butte area of Weston County for a reported potential of 300 bbl. of oil daily, flowing from Newcastle perforationsc 5,707-16 ft. The well is about 5 miles north and slightly east of Clareton production, and is directly west of westernmost production in Mush Creek field.

Potential Reported at Dugout Creek Well

Continental Oil Co. reported an estimated swabbing potential of 96 bbl. of oil per day at 2 Government "A" 33, SW NW SW 33-43n-80w, in the Dugout Creek area of Johnson County, west of production in West Sussex field. Production is from Shannon at 1,980-84 ft. and 1,996-2,016 ft. and the formation was sand oil treated before completion. Flow of 57 bbl. of oil in 12 hours was

Important Features



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reported prior to swabbing. The discovery in this area where there are now 18 locations or drilling or producing wells was made by Earl Mallette, Casper independent. This operator drilled 1 Government, SE SW 33-43n-80w, and made a successful Shannon completion without release of information. No previous gage has been announced from the area, despite operations by Mallette, Continental and The Texas Co.

CANADA

Nine Wildcats Hold Exploratory Interest in Area

Nine exploratory drillers were in the spotlight in the western Canada oil industry during the past week as they accounted for two indicated oil discoveries and seven gas strikes. Both of the oil finds recorded in the week ending September 4 were located in Saskatchewan, while the seven natural gas discoveries were all chalked up within the borders of Alberta.

The Saskatchewan wells that gave promise of commercial crude oil production are located in the Forget area in the southeastern sector of the province, 90 miles southeast of Regina, and in the Moser sector of southwestern Saskatchewan 30 miles northwest of Maple Creek. Alberta's gas finds were divided among wildcats in Denhart and Nacmine areas in the south of the province, Kessler and Camrose in central Alberta, and the Sturgeon Lake region in the northwestern sector of the province.

The first oil strike last week was made at Williston Oil & Gas 1-19 Bobjo, LSD 1, 19-9-6w2, 3 miles north of the Tide Water 1 Forget Crown light gravity Madison formation oil discovery. This well gave up good oil showings on drill-stem tests from 3,951 ft. to 3,991 ft. At total depth, where crew ran and cemented production casing, the venture had opened up 40 ft. of oil pay without sign of formation water. Pay zone was comparatively tight, similar to previous oil strikes in the Williston basin area. Williston Oil & Gas, Ltd., operating unit for Federated Petroleums, Ltd., and Frobisher, Ltd., is drilling this test under farmout agreement from the Bobjo Mining Co. Production tests will be carried out immediately at this light crude oil find.

The other Saskatchewan find came at the Amurex Oil Development Co.'s 1-1 Moser wildcat. This test, on LSD 1, 17-14-26w3, located 15 miles northwest of Crane Lake, indicated commercial oil production from the J2B member of the Jurassic formation. Drill-stem test of interval 3,156 to 3,165 ft., about 5 ft. into the pay zone, gave up 60 ft. of free oil, 270 ft. of oil-cut mud, and 150 ft. of slightly oil-cut mud. Cores down to 3,192 ft. showed fracturing and oil stained porosity and crew is now preparing to run further tests. The 1-1 Moser is Amurex's eighth well on a 628,224-acre farmout from the Albercan Oil Corp.

Alberta's gas discoveries during the week were chalked up by five separate companies or groups of companies in that same number of separate areas. The farthest south find in the province came in the Viking sand formation (Bow Island) at Flock Gas & Oil Corp.'s second venture in the Denhart area, 117 miles southeast of Calgary. This well, Flock C. P. R. 2 Denhart, LSD 14, 11-20-11w4, found three different zones in the Viking formation. First zone flowed gas at 500 M.c.f. daily, while the 2nd gave up natural gas at 2,750,000 cu. ft. daily. Crew was coring in the third zone of that formation at last report and will run further tests this weekend.

The second discovery in southern Alberta

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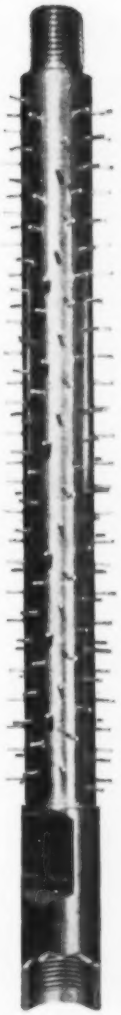
by Baird . . .



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was also recorded in the Viking horizon, this time at Stockton-Socony C. P. R. 2 Nacmine, LSD 8, 35-28-21w4, about 55 miles northeast of Calgary. This well that is scheduled as a D3 Devonian test gave up gas at rate of 2,470,000 cu. ft. daily from the Viking. Crew has now penetrated the gas discovery formation and is making hole below 4,797 ft.

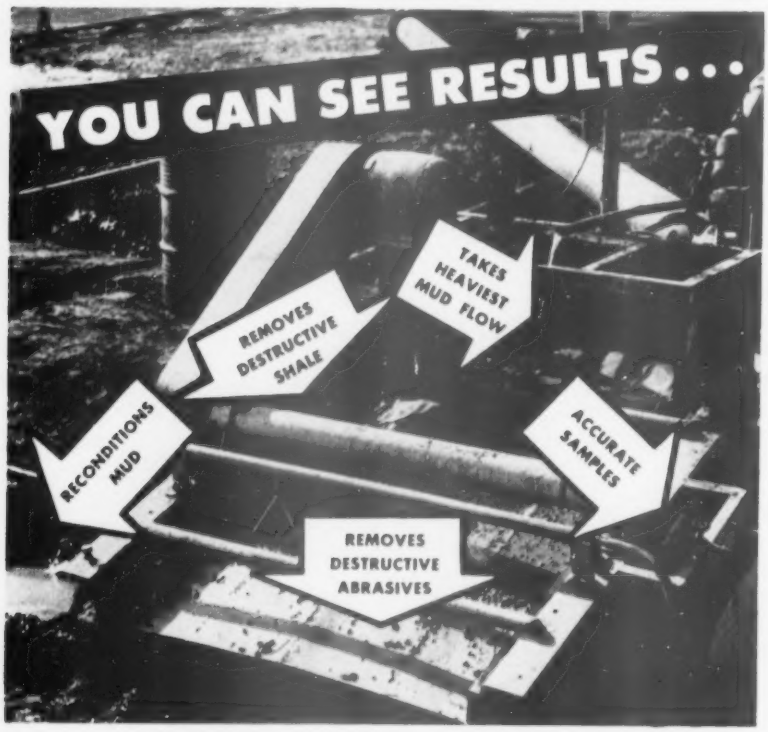
Central Alberta's newest potential gas producers include the Mill City-Kroy Oil-Sharples Oil (Canada)-Sweetgrass Oil team's current Kessler area test, and the Canadian Fina-Triad Oil team's exploratory venture in the south Camrose area. The Mill City and associates well, Mill City et al 1 Antone, LSD 11, 1-39-9w4, located around 110 miles east of Red Deer was classed as a Viking sand discovery when drill-stem test of interval 2,566 ft. to 2,593 ft., flowed this valuable product at daily rate 2,340,000 cu. ft. A previous test in the same formation had given up about 750 M.c.f. daily, while subsequent tests lower in the zone gave up only small amounts of drilling fluid. This strike will now be carried down to lower prospective oil and gas horizons. The Fina-Triad 1 Camrose test, on LSD 2, 29-46-20w4, about 1½ miles southwest of the town of Camrose, recorded gas success in both the Viking sand and Lower Cretaceous formations during the past week. The Viking horizon flowed gas at 3,500 M.c.f. while the Lower Cretaceous gave out 4,000 M.c.f. daily on best drill-stem test in that zone. A slight non-commercial showing of oil was also made in the base of the Cretaceous. Drilling is continuing at this well. If deeper formations are non-productive the well will be plugged back and completed as a potential gasser.

The final two gas strikes in Alberta were both recorded at the same well. These finds came in the Bluesky (Basal Cretaceous) and the Permo-Penn horizons at Amerada's "X" F 21-18 Crown wildcat, on LSD 14, 13-68-25w5, in the Sturgeon Lake area, 175 miles northwest of Edmonton. The Bluesky zone gave up gas at over 3,000 M.c.f. daily, whereas the Permo-Penn formation yielded gas at near that same figure. The later gas discovery formation also gave up a small amount of 42°-gravity crude oil. Other Amerada wells in the general area have given up gas in both the Bluesky and Permo-Penn formations but this is the first venture to show oil encouragement in the Permo-Penn.

EASTERN CANADA

Ontario . . . In Lambton County, Imperial Oil 1 Warwick, in Warwick Township near Watford, drilled in the early part of August with showings of oil and gas in the Guelph-Niagara formation below 2,000 ft. has been given an acid wash. After returning circulating oil and spent acid, the well flowed at the rate of 28 bbl. an hour on ½-in. bean with 500 psi. casing pressure and 150 psi. tubing pressure. Further tests are being made to determine the most efficient rate of production, with 150 bbl. a day anticipated. Imperial has started a new test on the McManus property, in the same general area.

A test drilled by William J. Hussey on the Robert Fairbank property in the east end of Petrolia reched the shallow oil horizon around 450 ft. and was deepening preparatory to a shot when the baler stuck across the hole, developing a difficult fishing job.



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ARKANSAS

Saulsbury Sand Pay Extended in Union

C. G. Davis Drilling Co. has extended Saulsbury sand pay ¾ mile to the southwest in the Rogers area of East El Dorado field in Union County.

The 1 Ripley, C NE NE SW 23-17s-15w, flowed 180 bbl. of 40°-gravity oil per day through ⅛-in. tubing choke from perforations at 3,044-46 ft. Oil sand, the Travis Peak-Saulsbury, was found at 3,045-63 ft. Pan Am Southern Corp. has begun operations at 22 Ezzell, C SE SW NW 23-17s-15w, ¾ mile northwest of the discovery.

Union County's Rogers area has production in the Saulsbury, Meakin, Graves, and Tokio sands. The new extension in the Saulsbury sand promises to encourage continued active development in the area.

Four New Discoveries Completed in August

Murphy Corp. completed the discovery well in the East Atlanta area of Columbia County at 1 Birtie, C SW NE 6-19s-18w, flowing 71 bbl. of 42°-gravity oil per day through 12/64-in. choke from perforations at 7,588-98 ft. in the Cotton Valley.

Mid-Continent Petroleum Co. extended Pettit production at Springhill in Columbia County at 1 Ensey, C NW SW 2-20s-23w. The well pumped 216 bbl. of 34°-gravity oil per day after acid treatment.

Murray Petroleum Co. extended production in Miller County's West Fouke area at 1 Smith heirs, C NW NW NW 22-17s-27w, ¼ mile northwest of Fouke. The east extension, ¾ mile, pumped 115 bbl. of oil per day from perforations in the Tuscaloosa sand. The offset failed to find the pay sand productive.

Tom Palmer opened Boggy Creek field in Miller County at 1 Fouke estate, C SE NE NE 24-17s-28w. The well produced 115 bbl.

of oil per day from Paluxy perforations at 4,889-93 ft. A confirmation try, the southeast diagonal offset to the discovery well, is to begin operations soon.

KANSAS

Five Discoveries in State are Completed

Operators in Kansas have opened up five new pools in various parts of the state—on the Central Kansas uplift, in the Salina basin, and in the Hugoton embayment.

In Barton County Terteling and Sons have completed 1 Cole, SW SW SW 23-19s-13w, for 76 bbl. of oil per day from the Lansing lime. Kewanee Oil Co. has a Mississippian discovery at 1 Hinman, NW NW NE 25-25s-3e, Butler County. Pump potential was 10 bbl. of oil per day. C-G Drilling Co. opened a new pool in Rooks County at 1 Ordway "A," SW NW NE 16-10s-18w, for 22 bbl. of oil per day.

Southeast of Damme pool in Finney County in the Hugoton embayment W. L. Hartman completed 1 Finnup, NE NE NW 34-22s-33w, opening Finnup pool. The discovery was finaled for 434 bbl. of oil per day from the Mississippi.

Morris County in the Salina basin just west of the Nemaha granite ridge has a new Mississippian pool at Musgrove Petroleum Corp. 1 Bura, SW NW SW 30-17s-5e. Pump potential was 60 bbl. of oil per day.

MICHIGAN

A Detroit River "sour" zone oil pay, just above the Richfield zone in West Branch field, Ogemaw County, may bolster deeper horizon development in this old Dundee oil pool. The Richfield has been under development in this area for several months, and although it has met with some success it has still been short of spectacular. This other horizon, now under test at one well and known to be present at one or more others which have reached the Richfield, may prove to be an important addition to the deeper development provided wells can be completed successfully in both horizons on a dual zone completion basis.

The first well to be perforated and tested in the Detroit River objective at West Branch is the Gallaher, English & Ehinger 1 Schubert, SE NE NW 19-22n-2e, pretty well up on the older Dundee structure. Upper (but still a so-called deeper zone in Michigan) pay was perforated with 24 shots at 3,652-62 ft., and with a like number of shots at 3,664-70 ft. After first 1,000 gal. acid treatment to perforated sections, and after load fluids had been recovered, well swabbed and flowed from 12 to 15 bbl. of oil a day. Tests were being run after a reacidization with 2,500 gal. This well was bottomed out in the Richfield at 3,995 ft. and was tested at about 10 bbl. of oil a day net after acid treatment in the Richfield with 6,500 gal. and before a bridge plug was set at 3,860 ft. to test the shallower pay.

Superior Oil Co. had an excellent new Eden field Dundee oil well at its 5 Sippy et al, SE SW SW 25-17n-16w, Eden Township, Mason County, and unofficial reports indicated that company would drill 5 or more new wells in this pool in the near future. This most recent completion was being restricted to about 100 bbl. of oil a day after a 250-gal. acid treatment, but less restricted flows of from 20 to 30 bbl. an hour, and up, were reported. Well is bottomed out in Dundee at 2,259 ft.

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LOUISIANA

NORTH LOUISIANA

Two New Pools Opened In Area in August

Northern Louisiana operators opened two new oil pools in the area during August, opened a new gas sand pay in South Sarepta field, and extended production in Lisbon field.

Carter Oil Co. opened a Wilcox pool, Roseland field, at 2 Orrin James about 2 miles west of Fairview field in Concordia Parish. The discovery flowed at the rate of 192 bbl. of 47°-gravity oil per day through 10/64-in. tubing choke. Production was from perforations at 6,747-49 ft. in the Wilcox sand. Location is in 26-4n-9e. A confirmation well, the 1 Whorton, 25-4n-9e, is under way.

Rodney Island field in Tensas Parish was opened by Heep Oil Corp. at 1 Magnolia-Learned, 12-10n-12e. On official test the discovery flowed at the rate of 166 bbl. of 39.6°-gravity oil per day through ½-in. tubing choke from perforations at 9,252-60 ft. in the Tuscaloosa sand. The confirmation try, 1 Sohio-Learned, is drilling 660 ft. northeast of the pool discovery well.

Bodcaw sand production of the Cotton Valley series was opened in South Sarepta field in Bossier Parish. Sunray Oil Corp. reported a flow of 63 bbl. of condensate plus 1,900 M.c.f. of gas per day through 14/64-in. tubing choke at 1 Boyd, 33-22n-11w. The new pay discovery extended production south.

Union Oil Co. of California extended production in old Lisbon field in Claiborne Parish 2 miles westward at 1 Caruthers, 22-21n-5w. The well pumped 64 bbl. of oil from the Three Finger lime.

SOUTH LOUISIANA

New Production Opened In East Black Bay Area

A new off-shore field, located in the East Black Bay area of Plaquemines Parish, has been opened by Gulf Refining Co. with the completion of a good oil producer at its 1 State Lease "QQ" 195. Location is spotted from USC & GS Station "Tela," in Township 17s-17e.

The well, producing from a casing-perforated interval in Miocene sand at 7,714-27 ft., flowed 162 bbl. of 29.4°-gravity oil on a 24-hour gage through 9/64-in. choke, with 750-psi. pressure on the tubing. Gas-oil ratio was 259 cu. ft. per barrel.

Promising oil showings were encountered in at least four other sand zones below 7,400 ft. These have not been tested.

Deep Production Proved Off Iowa South Flank

A deep oil-discovery well has been completed by Richardson & Bass a mile south of the Iowa field, east of Lake Charles, in Calcasieu Parish. It is the operators' 1 Watt, in 19-9s-6w, which flowed 417 bbl. of 38.1°-gravity oil per day through 8/64-in. choke, gaging 3,000-psi. pressure on the tubing with gas-oil ratio of 950 cu. ft. per barrel. Production is from sand at 10,962-72 ft. No water was indicated. Hole had been drilled to 11,512 ft. and has casing on bottom.

Two deep tests are being started by Shell Oil Co. about midway between the discovery and the Iowa field with prospect of proving up the intervening acreage. The new discovery is on a Shell "farmout."

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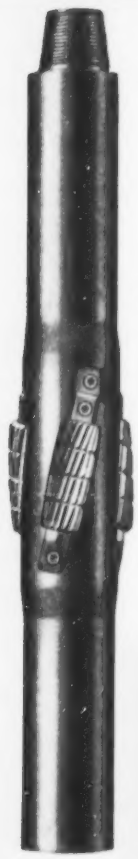

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APPALACHIAN AREA

WEST VIRGINIA

Glade district, Webster County, West Virginia, Herold Gas Co. 1 George A. Herold, wildcat, elevation, was completed and resulted in a dry hole at a depth of 1,530 ft. West Virginia Gas Corp. 1-575 Dewey Given, is drilling at 774 ft., elevation 2,373 ft. Plymouth district, Mercer County, United Fuel Gas Co. 6913 F. H. Cheatwood wildcat, elevation 2,481 ft., completed at 273,000 cu. ft. gas, after shot in Maxon sand 1,504-1,506 ft., Big lime 2,145-3,470 ft., Berea sand, 4,003-4,034 ft. TD 4,319 ft.

OHIO

Oxford Oil Co. drilled a thick section of Newburg sand, in a test intended for the Clinton, on 1 Ida Hefrick, Section 18, Hopewell Township, Perry County. Drilling was stopped at 2,297 ft. after finding a pay of 1,800,000 cu. ft. in the last 3 ft.

The first second Berea sand well newly drilled and fractured was completed by E. W. Calhoun on 1 R. Fisher, Section 16, Ames Township, Athens County. Sand was topped at 1,597 ft. and drilled to 1,612 ft. with an open flow of 40,000 cu. ft. which gaged 760,000 cu. ft. after blowing open 2 hours after treatment.

Two west extensions to Mt. Zion pool in Jackson Townships, Knox County, found gas in the top of the sand. Mid East 5 Dalmasso, Section 25, gaged 1,400,000 cu. ft. at 9 ft. in the sand while National Gas Co. 5 Jewell, Section 25, found 960,000 cu. ft. at 9 ft. in the sand.

TEXAS

NORTH TEXAS

Wichita Wildcat Finds Productive Oil Sand

Field sources indicated a new sand discovery and flush producer was in the making at Charles E. Morrison 1 Slaughter, 5 miles from production in Block 19, H&GN Survey.

Operators drilled into the oil sand at 3,790 ft., penetrated 8 ft. more and set pipe for completion. The well was said to have cleaned itself into pits, then gaged 50 bbl. of oil in 30 minutes, at which time it started flowing by heads.

Development work was already under way at Morrison's 1 P. G. Krohn, south offset to the discovery, which was drilling below 3,490 ft. In Block 21 of the same area, Prince Bros. Drilling Co. 1 L. B. Slaughter was rigging up to test the sand.

Grayson County . . . In the Big Mineral Creek area, The Texas Co. 2 Bush Jones flowed 227 bbl. of oil a day through ¼-in. choke from perforations between 6,294-6,350 ft. Total depth was 7,203 ft. Location in the James Coryell Survey, A-261, is 6 miles northeast of the town of Sadler.

Location for a 5,900-ft. test in the Whitesboro townsite has been made by Howell, Holloway and Howell as 1 G. P. Hawkins. Location in the Ada Hartsfield Survey, A-491, falls 528 ft. west of North Jordon Street.

Phillips Petroleum Co. 2-A Watson, in the Mackoy Strawn area 3 miles southeast of Whitesboro, developed 900 ft. of oil on a drill-stem test at 4,653-65 ft.

WEST TEXAS

Reef Structure Indicated By Schleicher Wildcat

Edwin L. Cox 1 J. F. Runge, 13 miles north and slightly east of Eldorado, early last week had penetrated 59 ft. of oil-saturated reef limestone, and was drilling ahead to continue testing on 20-ft. intervals.

Top on the reef by samples was 5,495 ft. on elevation of 2,151 ft. This was reported running 254 ft. high to a dry hole 1 mile southwest. First drill-stem test between 5,500-26 ft., open 2 hours, recovered 45 ft. of oil and 165 ft. of heavily oil-cut mud. A second test between 5,526-59 ft., open 72 minutes, recovered 3,000 ft. of clean oil and 230 ft. of oil and gas-cut mud. Location is about 3 miles from North Huldale and Neva West fields, which have had some prolific producers from reef limestone.

King County . . . Shell Oil Co. 1-D Burnett Estate, 16 miles southeast of Guthrie, reported oil shows in a limestone, thought to be of Canyon age, between 5,469-81 and from 5,508-30 ft.

The first section above developed 10 ft. of heavily oil and gas-cut mud, but had little flowing pressure. Second test, open 1 hour, recovered 250 ft. of gas and 20 ft. of slightly oil-cut mud. Drill samples showed limestone with pinpoint porosity and a strong show of gas from 5,620-40 ft. The last reported test at 5,621-50 ft. recovered salt water with no shows of oil or gas. Operators were drilling ahead.

Dawson strike completing . . . Seaboard Oil Co. 1 Herman Pettaway, reef discovery in southeast Dawson County estimated to have nearly 300 ft. of pay section, was running potential tests. Flowing through 16/64-in. choke, the first 18 hours of a 24-hour test gaged 395 bbl. of oil. Earlier flow tests had gaged up to 77 bbl. hourly.

SOUTHWEST TEXAS

Oil Production Opened in South Robstown Gas Area

Oil production has been established in the South Robstown gas field, south of Robstown, in Nueces County. The new discovery well, Warren Petroleum Co. 1 Halpert, in Section 17, George H. Paul Subdivision of the Driscoll Ranch, flowed 339 bbl. of 37°-gravity oil per day through ¼-in. choke on completion gage with 475 psi. pressure on the tubing.

Production is from a sand interval at 5,598-5,604 ft., open through casing perforations, with bottom of the hole at 6,900 ft. and casing at 6,590 ft. Location is an east offset to a dually completed gas well, Southwestern Oil & Refining Co. 1 Ruegg, producing from sands at 6,503-06 ft. and 6,904-07 ft.

TEXAS GULF COAST

New Producer Confirms Indian Hills Discovery

Discovery last April of Cockfield production in the Indian Hills area of northern Harris County has been confirmed with completion by W. R. Godsey of an oil producer at his 1 Meyer.

The new well, located 1,200 ft. northeast of the discovery producer (Federal Royalty

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Co. 1 Schweinle), flowed 40.6 bbl. of 39°-gravity oil per day through 12/64-in. choke. Pay is open through casing perforations at 5,540-44 ft.

A previous attempt by Federal Royalty Co. to confirm its discovery met with failure. The failure, 2 Schweinle, was approximately 2,415 ft. north of the discovery well.

Frio Spreads at Big Hill

Frio production at Big Hill, in Jefferson County, has been extended to the west side of the dome with completion by Deep South Oil Co. of its 1 Wangensteen flowing 298 bbl. of 30.4°-gravity oil daily through 9/64-in. choke from a casing perforated interval at 10,461-65 ft. Location is in the W. H. Bladwin Survey.

CALIFORNIA

Tejon Flats Wildcat May Be Successful

Testing of Julio V. Dougherty & Associates' wildcat in the Tejon Flats area at the southeast end of San Joaquin Valley indicated the wildcat might become a new field discovery. A 12-hour formation test at 8,447-75 ft. reportedly resulted in a 700 bbl. fluid flow, of which about 15 per cent was oil. The next section to be tested was 8,375-8,435 ft. according to field reports.

The wildcat, 65-14 "Well" in NW SE 14-11n-19w, is approximately 1 mile northwest of a test completed last March by Union Oil Co. It was completed in a Miocene sand at 6,912-19 ft. for 210 bbl. daily but production rapidly dwindled. The Dougherty test was first drilled to 8,793 ft. and then redrilled to 8,496 ft., where 7-in. casing was set at 8,483 ft.

New San Ardo Wildcats

General Petroleum Corp. has staked a wildcat 3 miles west of the Lombardi area of San Ardo field and about the same distance northwest of the field proper. The new Monterey County test, 67X-30 Garrissere, will be drilled in 30-22s-10e, or about 1 mile north of a 4,765-ft. dry hole drilled by The Texas Co. in 1948.

In NW NW 8-23s-11e, Bishop Oil Co. was under way with 1 Alexander-B. This test is about 1 mile east of nearest Lombardi production, the field's principal pay zone.

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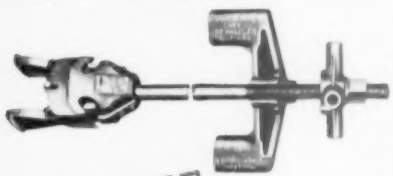

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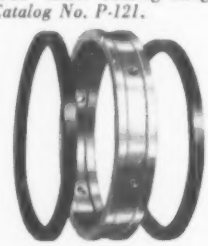

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FLORIDA

Key Largo Wildcat Quit After Salt Water Tests

Sinclair Oil & Gas Co. has abandoned its deep test, 1 Williams, on Key Largo, Monroe County, Florida, following a series of drill-stem tests in the Sunniland section which yielded salt water with only a trace of oil.

The hole had been drilled to a total depth of 11,968 ft. and plugged back for the tests. The lower Cretaceous Sunniland section, prodactive horizon of Humble Oil & Refining Co.'s Sunniland field, in Dade County, on the Florida mainland, the state's only production, was topped at 9,956 ft.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Aransas County: Union Producing Co. 10 Tatton, J. M. Shreve Sur., A-186. Dry. TD 11,378 ft.

Atascosa County: Alaska Steamship Co. et al 1 Younghlood, A. C. Carson Sur. 203, A-155. Dry. TD 3,006 ft.

Charles G. Dunwoody 1 Matt Davis, Jr., BS & F Sur. 19, A-126. Dry. TD 5,933 ft.

Caldwell County: O. W. Killam 1 Cardwell, Cornelius Crenshaw Sur. Dry. TD 1,840 ft.

Frio County: Wherry & Green 1 Dickerson, J. Poitevent Sur. 1379, A-550. IPP 41.95 BOPD, 39.1°, open hole 3,231-59 ft. TD 3,259 ft. (Extends Big Foot field.)

Gonzales County: De Lange & Neathery 6 Stulting, Robert Kelly Sur., A-307. Dry. TD 5,287 ft.

Hidalgo County: Fitzpatrick Drilling Co. 2 Yturria, Porcion 43. Dry. TD 5,115 ft.

Jim Wells County: Cyprus Oil Co. 2 Canales, McKinney & Williams Sur. 18, A-316. Dry. TD 5,960 ft.

Nueces County: Austral & Phillips 1 State, Tract 18, Corpus Christi Bay. Dry. TD 8,733 ft.

San Patricio County: Heep Oil Corp. 1 Webb et al, Section 23, George H. Paul Subd., J. J. Welder Ranch. Dry. TD 7,700 ft.

Travis County: P. J. Aylward 1 Nelson, P. C. Harrison Sur. Dry. TD 1,020 ft.

Webb County: Johnson Cone 1 Kirkpatrick, Silistino Llamds Sur. 116. Dry. TD 5,536 ft.

Wilson County: H. R. Smith 1 Wiseman, Juan Delgado Sur., A-8. Dry. TD 3,225 ft.

Zapata County: Miller & Pierce 1 Trevino, Blk. 183, McCullough Subd., El Grullo Grant. Dry. TD 2,005 ft.

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AND ONE BRAIN!

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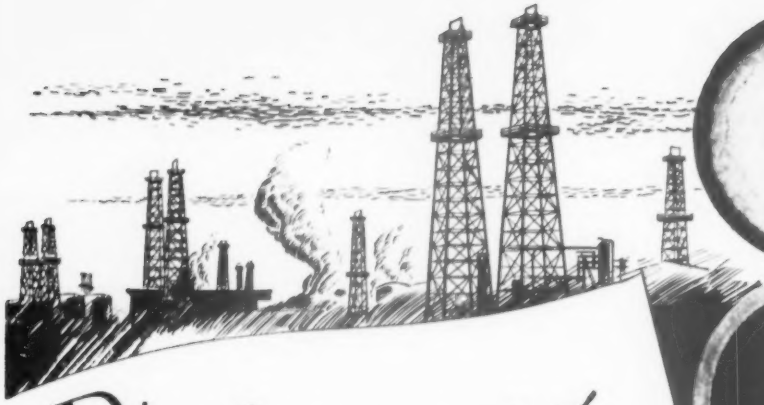

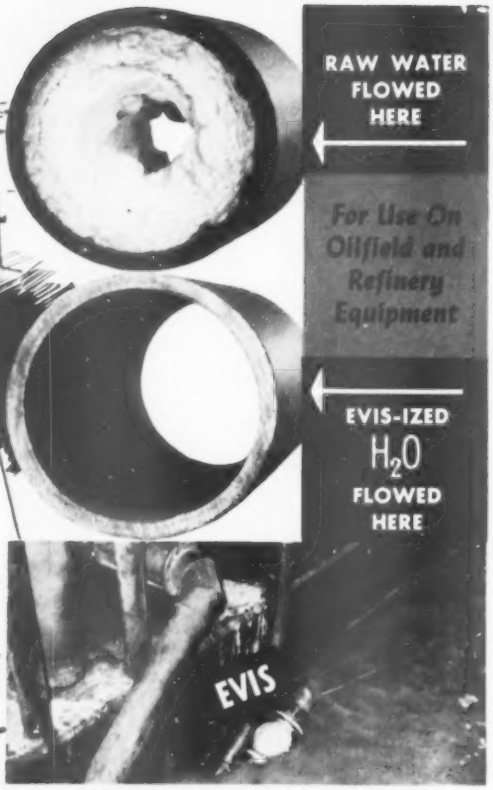

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• CONTINUOUS CATALYTIC RAW WATER CORRECTION •

WILDCAT COMPLETIONS

Zavala County: Shell Oil Co. 1 Plumly, GC & SF Sur. 3, A-839. Dry. TD 14,297 ft.

TEXAS GULF COAST

Brazoria County: Skelly Oil Co. 1-A Poole, J. P. Caldwell Sur., A-165. Dry. TD 13,013 ft.

Calhoun County: W. P. Clements, Jr. 1 State, Tract 33, San Antonio Bay. Dry. TD 9,030 ft.

Goliad County: Carter & Carter 1 Ramsey, Maria de Jesus y Bravo Sur., A-51. Dry. TD 8,125 ft.

Grimes County: Woodley Petroleum Co. 1 Frankow, Cyrus Campbell Lge., A-11. Dry. TD 8,407 ft.

Hardin County: Samedan Oil Co. 1 Weiss-Hudson, Lot 24, Block 24, Spencer Osborn Sur., A-41. Dry. TD 10,020 ft.

Harris County: Russell Maguire 1 Mellinger, Section 17, WCRR Sur. 4, A-889. Dry. TD 8,017 ft.

Jackson County: V. A. Brill 1 LaBauve, J. H. Bell Sur., A-7. Dry. TD 8,504 ft.

Currie B. Davis et al 1 Mercer, William Menefee Sur., A-53. Dry. TD 7,008 ft.

W. Earl Rowe 1 Regina Gayle est., Edward Beaty Sur., A-6. Dry. TD 6,301 ft.

Karnes County: H. H. Howell 1 Schorre, Victor Blanco Sur., A-3. Dry. TD 6,902 ft.

A. O. Phillips 1 Krause est., Antonio de la Vina Sur. Dry. TD 8,012 ft.

Liberty County: John W. Mecom and Freeport Sulphur Co. 5-B W. F. Mayes est. et al, Victor Blanchett Sur. Dry. TD 9,836 ft.

Victoria County: A. O. Morgan 3-A Welder, SA&MG Sur. 11, A-330. Dry. TD 9,015 ft.

Wharton County: Husky Oil Co. 1 Robert Mielsch heirs, R. Boatright Sur., A-8. Dry. TD 8,306 ft.

EAST TEXAS

Red River County: Midwest Exploration Corp. 1 Rust, T&P Sur., 11 miles SE Annona. Dry. TD 5,080 ft.

Seaboard Oil Co. 1 Coline, Igenio Tejada Sur., 7½ miles N Talco field. IPP 155 BOPD, 37°, Travis Peak 4,920-26 ft. TD 7,500 ft.

WEST CENTRAL TEXAS

Brown County: C. F. Burch & George Hawk 1 Pylant, Sec. 37, J. M. Higgins Sur. Dry. TD 1,352 ft.

James H. Snowden 1 Roy Newton, Stephen Jones Sur. 282. IPP 36.7 BOPD 41°, pay 1,483 ft. TD 1,532 ft.

Callahan County: Cree Drilling Co. 1 Lee K. Smith, Sec. 34, BBB&C. Dry. TD 3,420 ft.

L. A. Hedrick 1 W. E. Williams, Sec. 20, BBB&C. IPP 51 BOPD, 38°, pay 1,295 ft. TD 4,380 ft.

Onyx Oil Co. 1 Anthony heirs, Sec. 3, D&DA. Dry. TD 4,227 ft.

Coleman County: Beasley, Dood & Thomas 2 C. L. Eeds, Sec. 276, James West Sur. IP 127 BOPD, 10/64-in., 41°, pay 1,568 ft. TD 1,578 ft.

Coronet Oil Co. 1 Beach, 83-2-GH&H. IP 24 BOPD, 16/64-in., 39°, pay 3,021 ft., TD 3,062 ft.

Gilchrist Drilling Co. 1 I. H. Neff, George Eubanks Sur. Dry. TD 3,458 ft.

Sid Katz Exploration Co. 1 Jennings, 22-2-GH&H. Dry. TD 3,170 ft.

Miami Operating Co. 1 Creswell Estate, A. McEwen Sur. 82. Dry. TD 3,224 ft.

Miller & Banks 1 J. M. Neff, Blk. 17, D. A. Murdock Sur. Dry. TD 2,388 ft.

Miller & Banks 1 Stanberry, Sec. 737, W. H. King Sur. Dry. TD 1,159 ft.

Trans Continental Oil Co. 1 Elmer Henderson, Mary McCarty Sur. Dry. TD 1,725 ft.

Haskell County: S. C. Herring Drilling Co. 1 Smith, R. E. Howell Sur. 210. Dry. TD 5,718 ft.

Thos. D. Humphrey & Sons 1 J. R. Coody, D. Casanova Sur., A-93. Dry. TD 5,700 ft., Ellenburger 5,584 ft.

Jones County: H. G. Lewis 1 Vaughn, 6-16-T&P. Dry. TD 4,931 ft.

Prince Bros. and Gehle Drillers 1-A Adamson, Sec. 7, GH&H. Dry. TD 4,021 ft.

Shackelford County: Buffalo Oil Co. 1 Vickers, Sec. 212, ETRR Sur. Dry. TD 1,950 ft.

G. E. Kadane & Sons 1 John Windham, 81-13-T&P. IP 168 BOPD, 21/64-in., 41°, pay 3,890 ft. TD 3,897 ft.

Throckmorton County: Russell Maguire 1 Swenson, Sec. 266, BBB&C. Dry. TD 5,226 ft.

Woodson Oil Co. 1 Ida Belle Allison, Sec. 2243, TE&L Sur. IP 105 BOPD, 14/64-in., pay 4,521 ft. TD 4,578 ft.

NORTH TEXAS

Archer County: T. B. Cochran and Wofford Cain 2-A Burt Lowry, Blk. 55, Harris Subd. Dry. TD 1,185 ft.

Osage Exploration Co. 1 Ikard, Joseph Levins Sur., A-260. Dry. TD 4,180 ft.

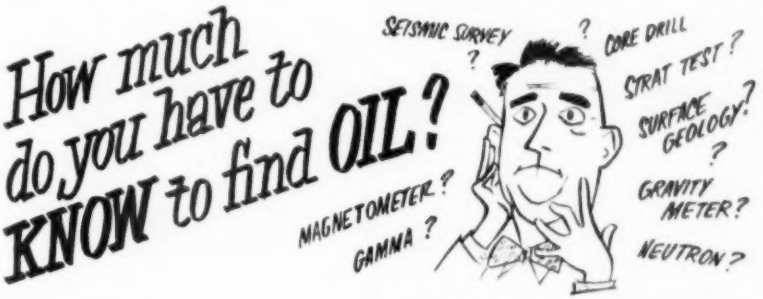
William T. Roberts 1-E Scott, T. E. James Sur., A-938. Dry. TD 1,235 ft.

John T. Wilson 1 J. M. Cleary, W. H. Bray Sur., A-1667. Dry. TD 4,060 ft.

Baylor County: Crown Central Petroleum Co. 1 Henry Harmel, Sec. 138, T&NO. Dry. TD 5,950 ft.

Clay County: Southern Petroleum Exploration Co. et al 1 T. J. Pace, Sec. 35, W. Spavin Sur. Dry. TD 4,915 ft.

Grayson County: L. O. McMillan 1 Ola Brown, A. Hernandez Sur., A-488. Dry.



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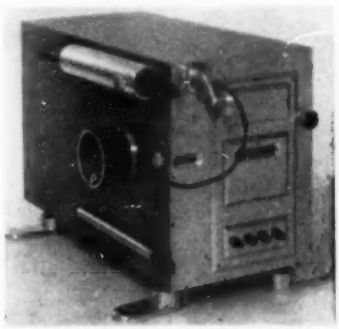

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WILDCAT COMPLETIONS

TD 7,443 ft. Oil Creek sand 7,373 ft. A. O. Phillips 1 Silas Elliott, E. Thompson Sur., A-1227. Dry. TD 8,837 ft.

Sun Oil Co. 3 George R. Ferrill, E. C. Smithson Sur., 11 miles NW Sherman. IP 212 BOPD, ¾-in., Barnes sand 5,277 ft. TD 5,351 ft.

Jack County: Russell Maguire 2 Campsey, C. C. Chance Sur., A-138. Dry. TD 5,538 ft.

Knox County: Humble Oil & Refining Co. 1-E McFaddin, 43-13-H&TC. Dry. TD 6,292 ft.

Montague County: Ada Oil Co. 1 Freda Kranow, Blk. 92, Hill CSL. Dry. TD 7,003 ft., elev. 1,079 ft., Caddo 6,090 ft., Viola 6,898 ft.

Jack Grace Production Co. 1 Boedecker, J. Diaz Sur., A-183. IP 46 BOPD, 32/64-in., conglomerate pay 5,968 ft. TD 6,907 ft.

W. L. Pickens 1 Donald, Sec. 66, Titus CSL. Dry. TD 6,221 ft.

Wichita County: Ralph Harper 1 Robertson, CTRR Sur., A-49. Dry. TD 1,470 ft.

Wilbarger County: E. C. Brown 1 Waggoner EM, 21-5-H&TC. Dry. TD 2,479 ft.

E. H. Pigg 1-A Pigg-McCrary, 65-14-H&TC. IPP 29 BOPD, 40°, pay 1,290 ft., TD 1,298 ft.

Young County: W. T. Waggoner Estate 1 J. L. Craig, Sec. 6, A. N. Dees Sur., A-1525. IPP 25 BOPD, Caddo 4,032-46 ft. TD 4,147 ft.

Woodson Oil Co. 1 J. W. Bullock, TE&L Sur. 423. IPP 125 BOPD, 41°, Mississippian lime 4,705 ft. TD 4,725 ft.

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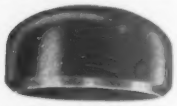
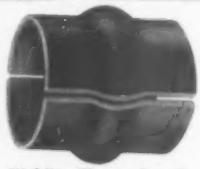


ASME and API-ASME Code Elliptical Heads and Hi-Pressure Weld Caps



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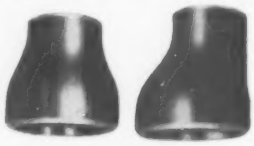

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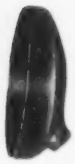

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WEST TEXAS

Borden County: Cosden Petroleum Corp. 1 Earl Sealy, 318-97-H&TC. Dry. TD 7,950 ft.

Dawson County: Parker Drilling Co. 1 L. S. Munger, 2-4 Taylor CSL. Dry. TD 8,910 ft., elev. 3,050 ft., Dean 8,641 ft.

Gaines County: Shell Oil Co. 1 Foster, 408-G-CCSD&RGNG. Dry. TD 11,436 ft., elev. estimated 3,490 ft., Pennsylvanian 10,160 ft., Devonian 11,354 ft.

Howard County: Oceanic Oil Co. and Green & McSpadden 1 Winans, 25-33-T3N-T&P. IP 1,764 BOPD, ¾-in., 42°, Pennsylvanian reef 8,140 ft. TD 8,195 ft. Discovery.

Loving County: Lawless Drilling Co. 1-A TXL, 3-55-T2-T&P. Dry. TD 4,014 ft.

Pecos County: Schermerhorn Oil Corp. 1 Montague, Sec. 106½, Blk. OW. IPP 104 BOPD, 27°, pay 3,065-3,100 ft. TD 3,110 ft.

Runnels County: Elders & Ogden 1 J. P. McCord, Sec. 530, Vaughn A&M Canal Sur. Dry. TD 4,117 ft.

J. B. Schick 1 Nora McCaughan, Sec. 14, T. Flower Sur. 440. Dry. TD 4,845 ft., elev. 1,839 ft., Caddo 4,770 ft.

Schleicher County: Warren Petroleum Corp. 1 Virgil Powell, 1-A-AB&M. IP 29 BOPD, 31°, Canyon pay 3,576 ft. TD 3,625 ft.

Sterling County: J. M. Hankins, Trustee 1 T. H. Humble, 30-11-SPRR. Dry. TD 1,564 ft.

Sutton County: Atlantic Refining Co. 1 Cash Joy, Blk. A, GWT&P Sur. Dry. TD 3,390 ft., elev. 2,177 ft., Strawn 5,826 ft.

Upton County: Hunt Oil Co. 1 Henry Cravens, 31-Y-University Lands. Dry. TD 12,660 ft., elev. 2,720 ft., Pennsylvanian 10,170 ft., Devonian 11,220 ft., Ellenburger 12,390 ft.

Pure Oil Co. 1-A Wanda Hanks, 52-C-CCSD&RGNG. Dry. TD 13,274 ft., elev. 2,790 ft., Strawn lime 10,710 ft., Devonian 11,775 ft., Silurian 12,360 ft., Ellenburger 13,132 ft.

Winkler County: Frank & George Frankel 1 W. C. Driver, 19-B6-PSL. Dry. TD 11,927 ft., elev. 2,944 ft., Mississippian 8,490 ft., Devonian 9,582 ft., Ellenburger 11,825 ft.

Yoakum County: British American Oil Producing Co. 1 Ida May et al, 30-K-PSL. Dry. TD 8,750 ft.

SOUTHEAST NEW MEXICO

Eddy County: David C. Saiken 1 Magruder, 28-23s-26e. Dry. TD 1,910 ft.

Lea County: Shell Oil Co. 1 EA State, 12-11s-37e. Dry. TD 11,862 ft., elev. 3,934 ft., Pennsylvanian 9,930 ft., Mississippian 11,290 ft., Devonian 11,825 ft.

NORTHERN NEW MEXICO

Rio Arriba County: J. Glenn Turner 1 Lockhard, SW NE SW 21-29n-6w. IP 6,640 M.c.f. of gas per day, Cliff House 4,925 ft. 7-in. 4,960 ft. shot 1,517 qt. 5,045-5,675 ft. TD 5,675 ft.

Colorado Oil & Gas Co. 6 Rosa unit, NE SW SW 27-31n-5w. Suspended indef. TD 6,300 ft.

Sandoval County: Lowry et al 1 Renkoff, SW NW NE 17-19n-4w. IPP 2½ BOPD, susp. indef. TD 4,695 ft. PBTD 2,212 ft. Mesaverde 711 ft.

ILLINOIS

Christian County: Theo. Myers 1 Corrington, SW SW NE 26-15n-1w. Dry. TD 2,035 ft.

Clinton County: F. L. Goldsmith 1 Tebbe, NW NW SE 5-2n-3w. Dry. TD 2,457 ft.

Edgar County: E. Zink 1 Roll, NW SW SW 17-14n-13w. Dry. TD 880 ft.

Edwards County: W. H. Bears 1 Bennett-

WILDCAT COMPLETIONS

Weber, SW NE NW 29-1n-10e. IPP 64 BOPD, Aux Vases 3,181-95 ft. TD 3,196 ft.

Gallatin County: John W. Ruby 1-A Mathias, NE SE NE 10-9s-10e. Dry. TD 1,962 ft.

Wayne County: C. E. Brehn 1 Bunnage, NE NE SW 14-1s-9e. Dry. TD 3,430 ft.

INDIANA

Daviess County: Ralph Landeny 1 Schnarr, SW SE SW 17-2n-7w. Dry. TD 1,294 ft.

Dubois County: Hoosier Drilling Co. 1 Merkel, NE SE NE 30-1s-3w. Dry. TD 1,951 ft.

Gibson County: Regional Development Co. 1 Kolb-Turpin, SW NW NW 22-1s-10w. Dry. TD 1,896 ft.

Paco Petroleum Co. 1 Mauck, SE SW SW 34-1s-11w. Dry. TD 2,265 ft.

Pike County: Hoosier 1 Johns, NE SE NE 28-1s-8w. Dry. TD 1,483 ft.

Posey County: Slagter Producing Co. 1 Seibert, NW SE NW 17-4s-12w. Dry. TD 2,006 ft.

Slagter 1 Allyne, NW SW NW 2-7s-13w. Dry. TD 2,850 ft.

Spencer County: Wm. Schuller 1 Hargis, NW SW SE 12-7s-6w. Dry. TD 1,105 ft.

Vigo County: Juan Petroleum Co. 1 Phillips, NE NE NW 7-12n-8w. Dry. TD 1,758 ft.

Warrick County: H. C. Farmer 1 Hilderbrand, SE SE SW 1-4s-6w. Dry. TD 1,152 ft.

Canter Drilling Co. 1 Taylor, SE SW NE 10-7s-8w. Dry. TD 1,415 ft.

KENTUCKY

Henderson County: The Texas Co. 1 Farmer, NE SW SW 12-P-25. IPP 28 BOPD, lower O'Hara 2,244-56 ft. TD 2,258 ft. Discovery of Oak Grove North pool.

Muhlenberg County: George S. Engle 1 Moore, NW SE SW 22-J-26. Dry. TD 2,438 ft.

MICHIGAN

Calhoun County: The Carter Oil Co. 1 Knapp, NE NE SW 6-4s-5w. Dry. TD 3,000 ft. in Niagaran.

Newaygo County: Admiral Oil Corp. 1 Jones, SW SW NE 21-14n-14w. Dry. TD 2,164 ft. in Traverse.

Van Buren County: Smith Petroleum Co. & Swanson Consolidated Oil Co. 1 Pollich, NW NW NE 19-3s-15w. Dry. TD 1,026 ft. in Traverse.

WEST VIRGINIA

Mercer County, Plymouth district: United Fuel Gas Co. 6913 F. H. Cheatwood, elevation 2,481 ft., 273,000 cu. ft. gas, in Maxon sand at 1,504-1,506 ft., Big lime 2,145-3,470 ft., Berea sand 4,003-4,034 ft., TD 4,319 ft.

Webster County, Glade district: Herold Gas Co. 1 George A. Herold, elevation 2,265 ft. Dry. TD 1,530 ft.

FLORIDA

Monroe County: Sinclair Oil & Gas Co. 1 H. R. Williams, C SW SE 25-59s-40e. Dry. TD 11,962 ft. Elev. 20 ft., lower Cretaceous 6,615 ft., Sunnyland zone 9,956 ft., massive anhydrite 10,171 ft., base anyhydrite 11,810 ft.

ALABAMA

Conecuh County: Lyle Cashion et al 1 Deming et al, C SW SW 12-5n-11e. Dry. TD 4,750 ft. Elev. 281 ft., Chalk 1,890 ft., Eutaw 3,257 ft., marine Tuscaloosa 4,000 ft., lower Tuscaloosa 4,120 ft., lower Cretaceous 4,523 ft.

MISSISSIPPI

Claiborne County: B. Serio and Justiss & Mears et al 1 Wilson, 8-11n-1e. Dry. TD 6,503 ft. Elev. 203 ft., Cook Mountain 1,875 ft., Sparta 2,055 ft., Wilcox 3,552 ft., base Big shale 4,900 ft., Artman lignite 5,282 ft.

Wilkinson County: Atlantic Refining Co. 1 Anderson-Mosely trustee, 30-3n-1e. Dry. TD 7,623 ft.

SOUTH LOUISIANA

Ascension Parish: George S. Engle 1 Alcus et al, SE SE SW 27-10s-3e. Dry. TD 10,506 ft.

Beauregard Parish: General Crude Oil Co. 1 Long Bell, 22-3s-7w. Dry. TD 9,502 ft.

Calcasieu Parish: California Co. 1 Farquhar et al, 17-10s-9w. (Lockport area). Dry. TD 7,581 ft.

Richardson & Bass 1 Wait, 19-9s-6w. IP 417 BOPD, 8/64-in., 38.1°, casing perforations 10,962-72 ft. TD 11,512 ft. (New field 1 mile south of Iowa Dome.)

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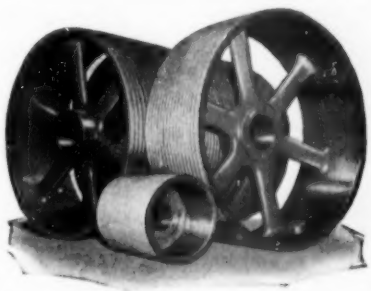

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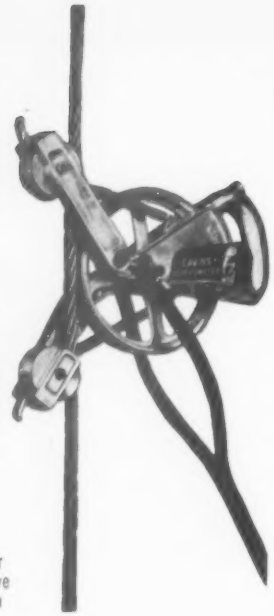

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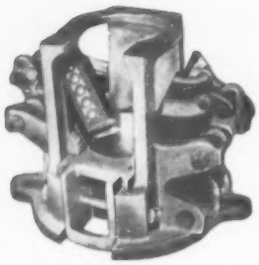

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1 **SAFETY:** The Spider is equipped with a manually operated safety latch which may be used to positively lock the slips in their closed position.

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Our technical and financial knowledge of the oil industry is available to principals of independently or family owned oil and gas properties. If you are contemplating a loan against present production or considering the acquisition or sale of producing holdings, our specialized experience may be helpful.

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Oil Department

Empire Trust Company

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JET-LUBE INC.

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CALIFORNIA

WILDCAT COMPLETIONS

Cameron Parish: British-American Oil Producing Co. 1 Sweet Lake, 5-12s-7w. Dry. TD 9,703 ft.

Orleans Parish: The Texas Co. 3 State Lease 1897-Shell Point, Township 11s-15e, Lake Borgne. IP 177 BOPD, ¾-in., 75.5°, casing perforations 9,103-40 ft. TD 9,887 ft. (New pay in Shell Point field.)

Plaquemines Parish: John W. Mecom 2 Rectangle Ranch, 36-21s-30e. IP 2,750 M.c.f. daily, ¾-in., casing perforations 2,345-55 ft. TD 14,145 ft. (New pay in Venice field.)

Pointe Coupee Parish: The Texas Co. 1 Bomer Blanks, 29-5s-9e. IP 160 BOPD, 9/64-in., 45°, Reno Sparta 10,398-406 ft. (casing perforations). TD 10,450 ft. (Extends Bayou Fordoche field.)

St. Mary Parish: Kerr-McGee Oil Industries, Inc., 1 Bessie, 39-13s-9e. IP 187 BOPD, 9/64-in., 30.3°, casing perforations 6,930-62 ft. TD 11,566 ft. (Extends, and new pay in Jeanerette field.)

ARKANSAS

Miller County: Algie D. Brown et al 1 Mann, C NE NW 4-15s-28w. Dry. TD 1,506 ft.

Monroe County: Oil & Gas Development Associates 1 Shannon, 160 ft. N and 410 ft. W SEc NE NE 4-4s-1e. Dry. TD 4,350 ft.

NORTH LOUISIANA

Bienville Parish: Hassie Hunt Trust 1 Youngblood et al, C NE NE 11-17n-7w. Dry. TD 8,000 ft. Hosston 7,310 ft.

Bossier Parish: Carter Oil Co. 1 Crystal-Whited unit, C SW NE 26-21n-12w. Dry. TD 10,047 ft. Bossier shale 9,969 ft.

Concordia Parish: W. H. Hunt et al 1 Brown, C NW SE 24-7n-6e. Dry. TD 6,003 ft.

Norton Oil Co. 1 Madison O&D Co. "A," C SE NW 36-6n-9e. Dry. TD 6,828 ft. Base Nebo 5,558 ft.

OKLAHOMA

Garfield County: Cities Service Oil Co. 1 Lewis "B," C NW NE 32-21n-3w. IPF 172 BOPD, lower Layton sand 4,786-4,805 ft., 42.8°, 12/64-in. TD 6,185 ft. (Oil discovery.)

Lincoln County: Deep Rock Oil Corp. 1 Rowan "A," SE SE SE 9-15n-4e. IPF 48 BOPD, Red Fork sand 4,085-95 ft., 37°, ¾-in. TD 4,900 ft.

Noble County: The Texas Co. 1 Steichen, NE NE SW 11-22n-1w. Dry. TD 4,990 ft.

Tide Water Associated Oil Co., Oliphant 1 Martin, SE SW SW 15-23n-1w. Dry. TD 5,079 ft.

Okfuskee County: Bond Oil Corp. and L. C. Tharpe 1 Foster et al, SE SW SE 16-11n-7e. Dry. TD 4,839 ft.

W. O. Allen, Jr. et al 1 Replogle, NW SE NW 5-11n-8e. Dry. TD 3,810 ft.

Osage County: Marshall Haddock, Jr. 1 Osage, SW SW SW 28-25n-6e. Dry. TD 2,946 ft.

Wilcox Oil Co. 1 Osage, NE SE SE 29-27n-9e. Dry. TD 2,523 ft.

Payne County: Gulf Oil Corp. 1 Offield, SW SW NE 31-18n-3e. Dry. TD 4,768 ft.

Woods County: Altus Drilling Co., N. B. Hunt, L. C. Tharpe 1 Smith, C NE NE 17-25n-13w. Dry. TD 7,535 ft. Arbuckle 7,364-7,535 ft.

KANSAS

Barton County: J. A. Tertling et al 1 Cole, SW SW SW 23-19s-13w. IPP 76 BOPD, Lansing-Kansas City 3,240-47 ft. TD 3,451 ft. (Opens Redbrick pool.)

Cowley County: Wakefield 1 Brown, SW NW SW 34-31s-6e. Dry. TD 3,034 ft.

Herndon Drilling Co. 1 Rusk, SE NE NW 12-33s-1w. Dry. TD 4,275 ft.

Edwards County: Natural Gas & Oil Co. 1 White, NE NE NW 26-24s-18w. Dry. TD 4,886 ft.

Ellis County: Shelley-Miller 1 Hoffman, SW SW SE 8-14s-17w. Dry. TD 3,587 ft.

Ellsworth County: Darrah-Garvin 1 Tymer, SE SE NW 6-17s-7w. Dry. TD 3,525 ft.

Gray County: United Producers 1 Knoeber, C SW NE 19-29s-27w. Dry. TD 5,460 ft. St. Louis 5,288 ft.

Harper County: The Texas Co. 1 Bird, NW NW SE 21-34s-5w. Dry. TD 4,596 ft.

Kingman County: H. H. West 1 McWithey, NE NE NW 18-27s-9w. Dry. TD 4,511 ft.

McPherson County: D. T. Ingling 1 Asp, SE SE NW 4-19s-1w. Dry. TD 2,943 ft.

Lafayette Oil 1 Kinsinger, SE SE NW 18-19s-3w. Dry. TD 3,832 ft.

Ness County: Barnett Oil 1 Wilhelm, SE SE NW 20-19s-21w. Dry. TD 4,499 ft.

Norton County: Jones, Shelburne & Farmer 1 Conover, SE NE SE 34-3s-24w. Dry. TD 3,784 ft.

Empire Drilling Co. 1 Shafer "E," NW NW NW 3-5s-22w. Dry. TD 3,644 ft.

Pawnee County: Isern Drilling Co. 1 Bailey, NE NE NE 17-20s-18w. Dry. TD 4,123 ft.

Musgrove Petroleum 1 Deckert, NW NW NW 30-20s-19w. Dry. TD 4,570 ft.

Pratt County: M. B. Armer 1 Elliott, SE SE NE 6-26s-14w. Dry. TD 4,517 ft.

Rooks County: Trans-Era 1 Anderson, SW SW SE 1-9s-20w. Dry. TD 3,662 ft.

Rush County: Morrison Drilling Co. 1 Legge, NE NE SE 21-17s-19w. Dry. TD 4,067 ft.

Stafford County: Amerada Petroleum Corp. 1 Chesky, SW SE NW 28-21s-11w. Dry. TD 3,518 ft.

NORTH DAKOTA

Pierce County: Calvert Exploration Co., Don Traders, Inc. 1 Boeller, C SW NW 22-

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THE OIL AND GAS JOURNAL

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PUTS AN END TO DOWN-THE-HOLE CHECK VALVE TROUBLE

WILDCAT COMPLETIONS

154n-74w. Dry. TD 3,511 ft. Lodgepole 3,316 ft.

NEBRASKA

Arthur County: Scott & Cameron 1 Haythorne, C SE SW 35-17n-39w. Dry. TD 3,104 ft. "J" sand 2,904 ft.

Cheyenne County, South Gurley: Ohio Oil Co. 1 Rauner, NW NW SE 15-15n-49w. IP 73 M.c.f. gas per day, "D" sand 4,490 ft., 5½-in. 4,575 ft., perfs. 4,490-4,506 ft. TD 4,706 ft. PBTD 4,510 ft.

J. M. Huber Corp. 1 Jung, SW SW SW 24-16n-52w. Dry. TD 5,336 ft.

Kimball County: Eddie Fisher 1 Heideman, NW NW NW 23-13n-56w. Dry. TD 6,765 ft.

CALIFORNIA

Colusa County: B. N. Development Corp. 1 Behring, 11-17n-1w. Dry. TD 4,200 ft.

Kern County: R. E. Bering, Opr. 23-A1 Ripley, 23-11n-23w. Dry. TD 380 ft.

Esendee Co. 1 Esendee-Westates, 25-29s-20e. Dry. TD 1,078 ft.

General Petroleum Corp. 33-X General American, 30-31s-24e. Dry. TD 10,030 ft.

W. W. Holmes, Oper. 53-22 W. P., 22-31s-24e. Dry. TD 5,725 ft.

Peter Palm 1 Cortner, 36-25s-18e, deepened from 795 ft. Dry. TD 1,212 ft.

Richfield Oil Corp. 34-28 Gordon, SE NW 28-11-20w, IPF 1,152 BOPD on 2-hour gage, 34.8° gravity, perforations 10,069-10,323 ft., TD 10,325 ft. (About ¼ mile east extension to Wheeler Ridge-Eocene pool.)

Richfield Oil Corp. 276-29 K.C.L.-D, NE SE 29-11-20w, IPF 339 BOPD, 43.8° gravity, perforations 6,229-6,457 ft., TD 6,460 ft. (New shallower Miocene, Vedder sand, pool in Wheeler Ridge field.)

Superior Oil Co. 1 Cymric Unit, SE SE 22-29s-21e, IPF 131 BOPD, cut 4.5 per cent, 14/64-in. bean, 27.2° gravity, perforations 6,494-6,530 ft., TD 12,022 ft., PB 6,550 ft. (New deeper pool discovery in Cymric field.)

Union Oil Co. 62-34 Kernco, NW NE 34-28s-25e, IPF 330 BOPD, cut 5 per cent, 18/64-in. bean, 34.5° gravity, perforations 11,322-11,698 ft., TD 13,499 ft. (New pool discovery, upper Helbling sand, in Rio Braxo field.)

San Benito County: Bell Petroleum Co. 1 Jacques, 20-12s-5e. Dry. TD 5,017 ft.

Santa Barbara County: Douglas Oil Co. 1-28 Douglas-Fletcher, 22-9n-33w. Dry. TD 3,620 ft.

Ventura County: Standard Oil Co. of California 1 Freeman, 21-4n-22w. Dry. TD 8,686 ft.

MONTANA

Carbon County: Carrol J. Kirk et al 1 Stow, NW NW SE 14-7s-22e. IPF 16 BOPD, -in. choke, Greybull 5,854 ft. TD 6,060 ft. 7-in. 5,958 ft., perfs. 5,854-66 ft.

Musselshell County: Devils Basin, Farmers Union Central Exchange 2 NPRR, NE NW SW 5-10n-25e. IPP 20 BOPD, 5½-in. 2,229 ft., perfs. 2,175-85 ft. TD 2,230 ft. Heath 1,866 ft.

Sheridan County: Zack Brooks 1 Larson, C NW SW 2-32n-55e. Dry. TD 8,760 ft. Lodgepole 7,994 ft.

Stillwater County: Lake Basin, Superior Oil Co. 71-22 Copulos, NW NE NE 22-2n-21e. Dry. TD 7,929 ft. Pre-Cambrian 7,885 ft.

WYOMING

Big Horn County, Hyatteville: Sohio Petroleum Co. 1 Unit, NE NE NW 28-49n-89w. Dry. TD 944 ft.

Sublette County: Arthur B. Belfer 1-C Government, C NW NE 23-28n-113w. IP 3,600 M.c.f. of gas per day, Hilliard 2,542 ft. (?), 7-in. 2,676 ft. perfs. 2,692-2,704 ft. TD 2,709 ft. (Gas discovery, South Big Piney.)

Tosi Creek: Antony Gorges 1 Government, C NE NE 22-39n-111w. Suspended. TD 665 ft.

Weston County, Wild Horse Butte: Irving Pasternak 1-B Johnson, C NW SW 13-44n-65w. Newcastle pay 5,707-16 ft., 5½-in. 5,771 ft. perfs. 5,707-16 ft., IPF 300 BOPD. TD 5,771 ft.

COLORADO

Adams County: Tuley & Carter 1 Scholz, NE NW SW 6-3s-58w. Dry. TD 6,315 ft.

Logan County: Bonham, Lowell & Daniels, Inc. 1 Bonham C-12, SW NE SE 27-8n-55w. IPF 24 BOPD, "J" sand 5,387 ft. 5½-in. 5,433 ft., perfs. 5,391-5,405 ft. TD 5,433 ft.

Rex Monahan 1 Smalley, SE SE SE 10-7n-53w. Dry. TD 4,950 ft.

Morgan County: McElroy Ranch Co. 1 Arnold, SE NE SW 33-2n-57w. Dry. TD 5,534 ft.

SASKATCHEWAN

Imperial-Tide Water 14-17 Broadview, LSD 14, 17-15-4w2. Dry. TD 3,600 ft.

Socony-Sohio 1 Duval, LSD 9, 20-25-21w2. Dry. TD 5,003 ft.

Socony-Woodley-Southern 17-4 Illerbrun, LSD 4, 17-12-18w3. Dry. TD 4,423 ft.

Tide Water 4 Parkbeg Crown, LSD 16, 18-18-3w3. Dry. TD 3,839 ft.

Socony-Woodley-Southern 1 St. Antoine, LSD 4, 24-6-32w1. Dry. TD 4,310 ft.

Sohio 9-36 St. Hubert, LSD 9, 36-14-3w2. Dry. TD 2,717 ft.

ALBERTA

Texaco-McColl 1-A East Bonnie, LSD 2, 12-47-27w4. Dry. TD 7,162 ft.

Yankee Canuck 8 Bonnyville, LSD 11, 33-60-6w4. Dry. TD 1,250 ft.

British American-Cities Service 7-13 Coghill, LSD 7, 13-39-24w4. Dry. TD 6,230 ft.

Britalta Royalite 1 Eagle Butte, LSD 15, 18-8-4w4. Dry. TD 4,425 ft.

Imperial 16-16 Foley Lake East, LSD 16, 13-51-23w4. Dry. TD 3,490 ft.

Regency 1 Citation, LSD 4, 11-55-2w4. Duvernay oil well. Suspended. TD 4,502 ft.

LEGAL

Notice is hereby given that sealed bids on oil and gas leases on approximately 46,826.55 acres of Turtle Mountain Public Domain Allotments located in Daniels, McCone, Richland, Roosevelt, and Sheridan Counties in Montana, and Divide and Williams Counties in North Dakota, will be opened at 2:00 o'clock P. M., Mountain Standard Time, September 29, 1953, at the Fort Peck Indian Agency, Poplar, Montana. Those individuals desiring specific information in connection with this sale may contact Mr. James D. Crawford Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone Poplar 2181.

VICTOR *ALLOY STUDS*

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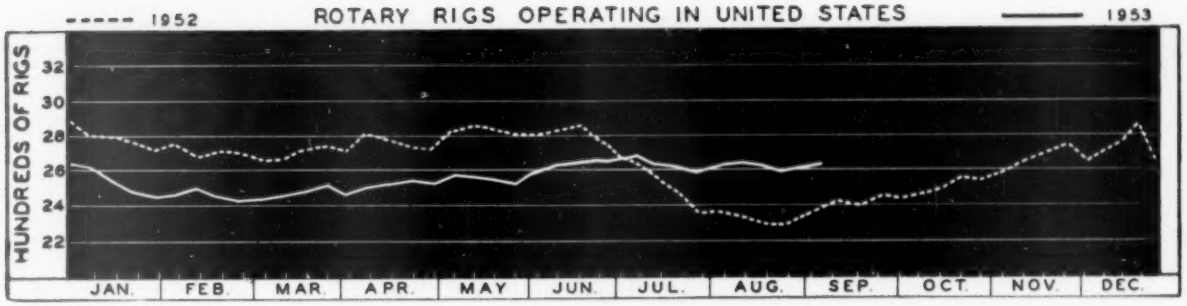
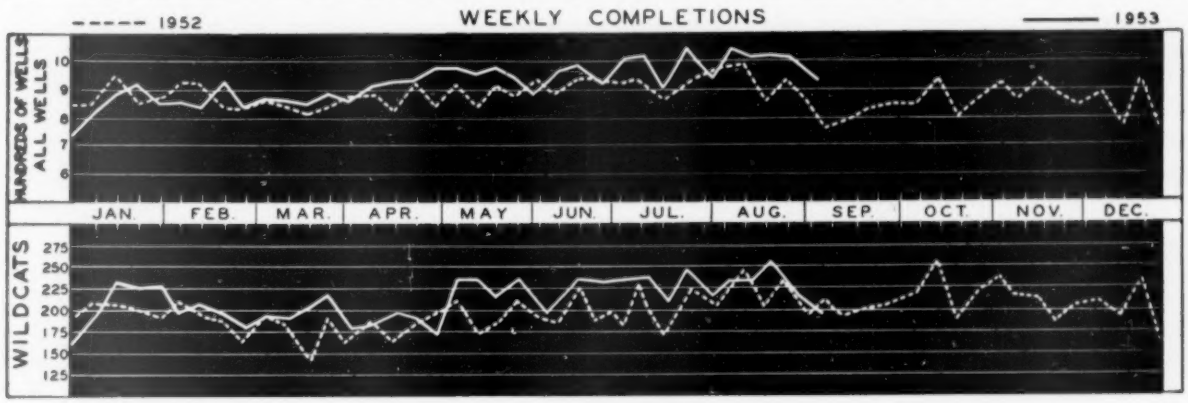




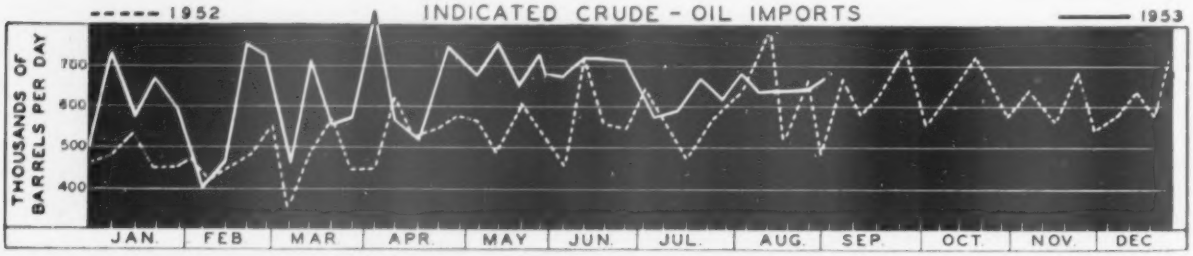
CURRENT STATISTICS

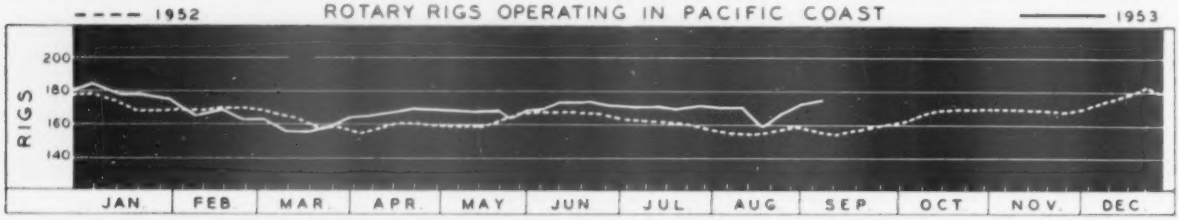
EXPLORATION

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 5, 1953

	Total of all wells					Sept. 5		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	18	9	0	*9	26,375	502	547	0	0	0	0	0	0	0	0	0	0
Pennsylvania	47	21	5	†21	86,200	1,247	1,337	0	0	0	0	0	0	0	3	11	14
West Virginia	17	1	12	4	58,550	429	407	0	0	1	1	2	0	0	8	4	12
Ohio	21	9	3	§9	37,897	709	714	0	0	0	0	0	2	0	2	12	16
Indiana	34	11	0	23	60,140	887	850	0	0	0	11	11	11	0	2	236	249
Kentucky	21	7	5	9	36,727	747	874	1	0	0	2	3	7	0	1	124	132
Illinois	41	20	0	21	100,359	1,279	1,364	1	0	0	5	6	5	0	0	276	281
Michigan	13	7	0	6	27,978	404	487	0	0	0	3	3	11	0	5	165	181
Kansas	82	42	4	36	277,266	3,298	3,174	1	0	0	19	20	72	0	27	521	620
Nebraska	10	5	1	4	53,757	228	185	0	0	1	3	4	14	0	4	96	114
Oklahoma	138	86	4	§48	543,331	4,952	3,941	2	0	0	8	10	80	6	25	435	546
Texas	277	160	9	108	1,328,667	11,677	12,277	16	0	0	70	86	604	41	132	2,869	3,646
North Central (Dist. 7-B & 9)	119	66	0	53	416,054	4,413	3,924	11	0	0	29	40	317	0	14	1,169	1,500
West (Dist. 7-C & 8)	64	47	0	17	374,008	2,511	3,800	3	0	0	12	15	119	2	12	454	587
Panhandle (Dist. 10)	10	6	3	1	31,231	542	483	0	0	0	0	0	0	2	9	15	17
Eastern (Dist. 5 & 6)	8	7	0	1	45,270	535	580	1	0	0	1	2	15	2	4	181	202
Gulf Coast (Dist. 2 & 3)	40	21	1	18	293,818	1,722	1,832	0	0	0	14	14	78	16	54	455	603
Southwest (Dist. 1 & 4)	36	13	5	18	168,286	1,954	1,658	1	0	0	14	15	75	19	48	595	737
Louisiana	72	43	4	25	485,593	1,767	1,573	4	0	1	8	13	55	25	17	239	336
Northern	33	19	3	11	102,347	720	840	0	0	0	4	4	7	2	2	88	99
Southern	39	24	1	14	383,246	1,047	733	4	0	1	4	9	48	23	15	151	237
Arkansas	13	7	0	6	35,778	339	261	0	0	0	2	2	10	0	0	75	85
Mississippi	4	2	0	2	27,229	248	249	0	0	0	2	2	12	1	4	117	134
Southeastern States	2	0	0	2	16,712	98	47	0	0	0	2	2	1	0	0	79	80
Montana	11	6	0	5	47,086	265	189	2	0	0	2	4	10	0	0	67	77
Wyoming	18	10	4	4	76,347	479	442	1	0	1	3	5	16	0	1	88	105
Colorado	19	10	0	9	104,310	461	293	1	0	0	5	6	20	0	9	205	234
Utah	0	0	0	0	0	47	53	0	0	0	0	0	2	0	4	26	32
New Mexico	26	14	6	6	157,850	924	714	0	0	1	4	5	14	0	8	86	108
California	43	32	1	10	220,592	1,729	1,652	4	0	0	9	13	45	0	8	384	437
North Dakota	4	3	0	1	29,059	175	48	0	0	0	1	1	7	0	0	38	45
Miscellaneous	0	0	0	0	0	54	84	0	0	0	0	0	1	0	3	34	38
Total United States	931	505	58	368	3,837,803	32,945	31,759	33	0	5	160	198	999	73	263	6,187	7,522
Total previous week	1,010	517	78	415	3,955,199			17	0	5	193	215	966	73	258	6,027	7,324
Total September 6, 1952	775	355	59	361	3,315,173			29	2	5	176	212	968	62	173	5,777	6,980

Service wells included: *9, †18, ‡1, §5.



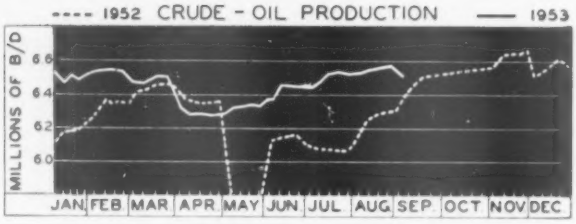


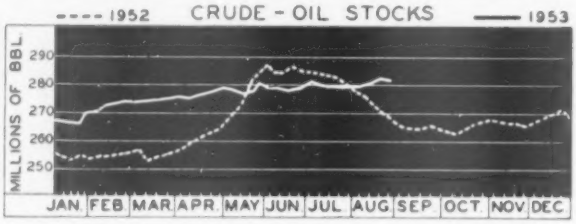
DAILY AVERAGE PRODUCTION FOR WEEK

	September 5			Aug. 29
	Crude oil	Lease condensate	Total	total
Alabama	5,100		5,100	5,200
Arkansas	77,450	400	77,850	78,100
California	1,009,800		1,009,800	1,009,800
Colorado	111,600		111,600	109,500
Eastern	59,200		59,200	59,200
Florida	1,525		1,525	1,550
Illinois	166,600		166,600	163,600
Indiana	34,200		34,200	34,000
Kansas	318,900		318,900	334,700
Kentucky	31,300		31,300	31,500
Louisiana	664,725	38,850	703,575	696,875
North	108,300	2,850	111,150	110,700
South	556,425	36,000	592,425	586,175
Michigan	31,800		31,800	35,800
Mississippi	93,550	3,350	96,900	95,400
Montana	31,200		31,200	31,400
Nebraska	16,400		16,400	16,700
New Mexico	200,200	550	200,750	199,950
Oklahoma	559,700		559,700	561,400
Texas	2,774,650	45,000	2,819,650	2,884,575
Dist. 1	39,600	350	39,950	40,025
Dist. 2	151,775	5,500	157,275	163,175
Dist. 3	447,250	22,800	470,050	476,100
Dist. 4	261,675	5,700	267,375	276,700
Dist. 5	48,675	400	49,075	50,100
Dist. 6	127,475	4,900	132,375	133,600
East Texas field	250,450		250,450	246,600
Dist. 7-B	117,800	50	117,850	120,675
Dist. 7-C	164,675	4,200	168,875	177,150
Dist. 8	901,250	700	901,950	934,775
Dist. 9	188,600	350	188,950	189,125
Dist. 10	75,425	50	75,475	76,550
Utah	5,000		5,000	5,400
Wyoming	209,000		209,000	212,000
North Dakota	14,100		14,100	13,800
Total U. S.	6,416,000	88,150	6,504,150	6,580,450
Change from previous week,			down 76,300	
Canada	257,900		257,900	257,900

Total U. S. production January 1-September 5 1,600,926,500 bbl.
Same period last year (crude plus cond.) *1,526,514,125 bbl.

*Includes 21,580,685 bbl. condensate.



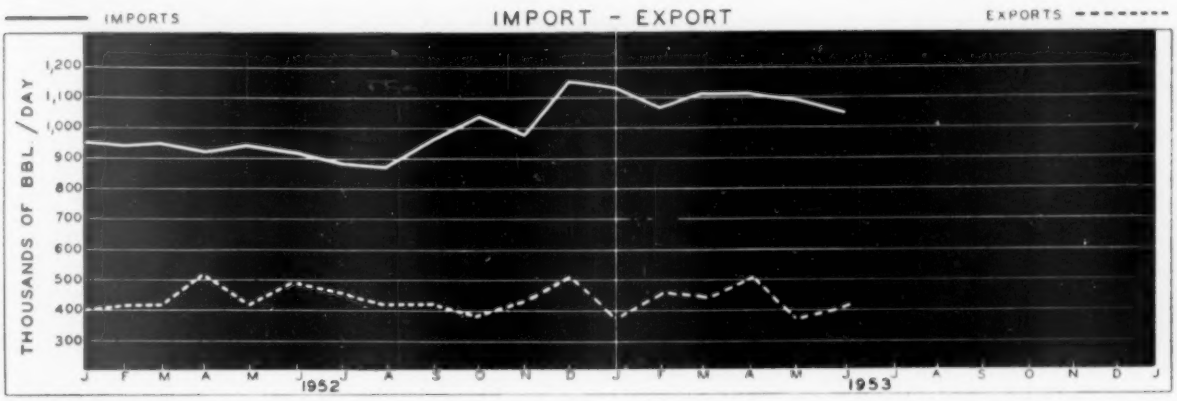


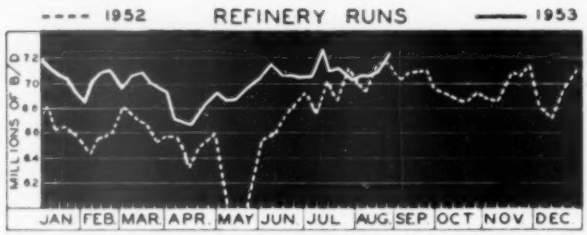
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

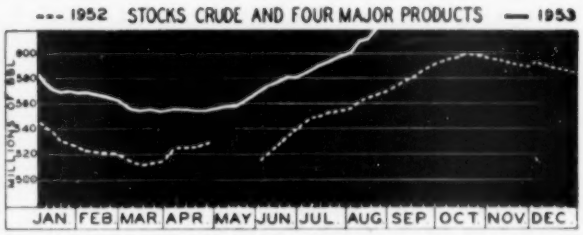
(Thousands of barrels)

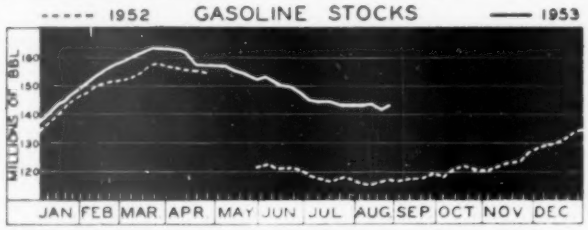
	Aug. 29, '53	Aug. 22, '53	Aug. 30, '52
Pennsylvania Grade	2,771	2,716	2,376
Other Appalachian	2,351	2,326	2,145
Illinois, Indiana, Michigan	12,262	12,539	13,172
Arkansas	2,872	2,825	3,168
Louisiana	16,806	16,748	14,792
North	2,771	2,885	2,404
Gulf	14,035	13,863	12,388
Mississippi	3,477	3,581	3,696
New Mexico	8,930	9,231	7,480
Oklahoma and Kansas	39,366	39,398	38,907
Texas	132,575	132,916	127,606
East Texas	11,505	11,578	13,183
West Texas	58,378	58,469	56,051
Texas Gulf	27,876	28,605	26,794
Other Texas	34,616	34,264	31,578
Rocky Mountain	17,045	17,084	14,347
California	33,884	33,376	31,315
Foreign	†10,372	10,018	7,581
Total	282,711	282,758	266,585

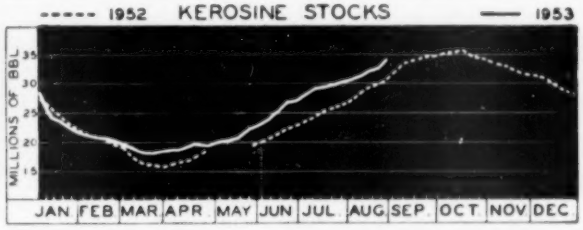
*Bureau of Mines. †Includes 2,721,000 bbl. in California.

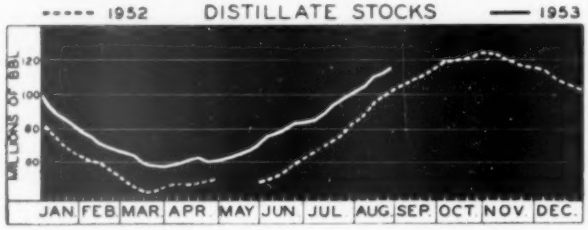


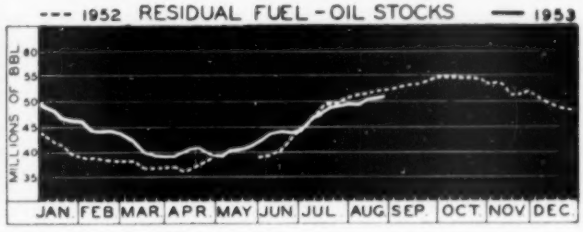










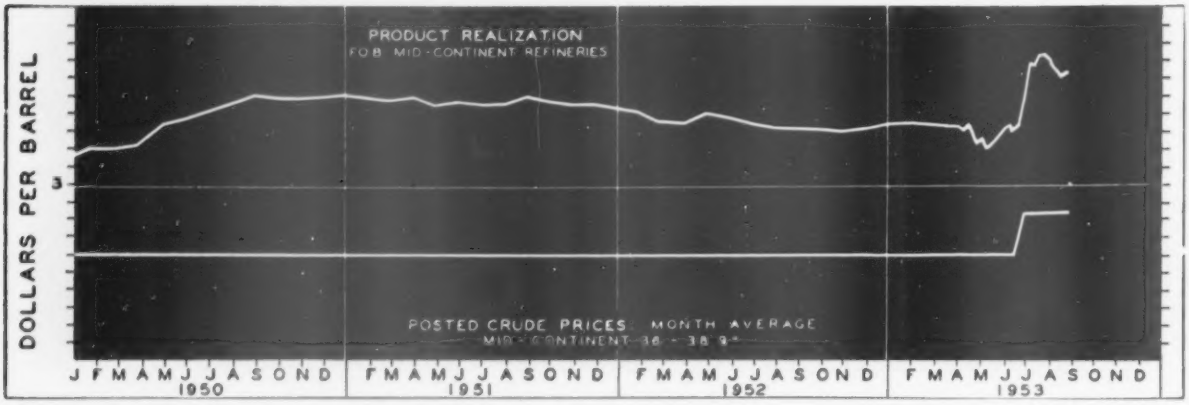


A.P.I. REFINERY REPORT, SEPTEMBER 5

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1952—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	103	434.7	36.6	283.6	225.4	33,682	14,600	42,989	13,229	1,079	437.0	50.6	257.4	223.4
Appalachian:														
District 1	94	43.0	3.1	14.3	8.9	3,443	591	1,287	648	114	46.8	6.0	17.3	12.2
District 2	97	54.3	4.9	11.4	12.1	1,524	584	575	145	79	41.0	3.0	12.7	16.6
Ind., Ill., Ky.	1,339	732.6	79.4	212.7	176.3	28,539	9,085	21,642	4,665	1,283	704.2	71.3	238.2	158.7
Okla., Kans., Mo.	620	364.9	19.9	141.4	50.7	14,704	2,507	12,678	1,155	576	335.1	14.7	138.1	56.4
Inland Texas	260	170.2	9.7	49.2	32.9	5,570	627	1,991	1,588	256	183.1	11.7	45.0	37.9
Texas Gulf Coast	1,716	821.4	98.7	376.0	221.7	19,371	3,758	15,029	7,185	1,729	815.6	123.4	414.5	267.1
La. Gulf Coast	563	282.1	43.0	146.7	58.2	8,151	2,786	7,350	1,610	508	256.1	50.1	140.9	56.8
N. La. and Ark.	85	33.6	6.1	18.4	3.4	3,019	646	667	94	87	36.3	7.2	21.4	6.7
Rocky Mountain:														
New Mexico	19	12.4		3.0	3.7	189		38	28	16	10.4	0.6	2.5	3.4
Other Rocky Mtn.	257	120.4	3.3	56.3	42.0	4,588	301	2,848	1,002	246	117.8	5.9	46.9	44.2
California	1,075	474.0	23.2	126.3	471.6	20,070	416	13,880	19,681	1,044	444.9	5.4	166.9	346.2
Sept. 5, 1953	7,228	3,543.6	327.9	1,439.3	1,306.9	142,850	35,901	120,974	51,030	7,017	3,428.3	349.9	1,501.8	1,229.6
Aug. 29, 1953	7,234	3,549.7	320.1	1,485.3	1,175.1	143,287	34,725	117,032	50,912					
Sept. 6, 1952	7,021	3,317.1	370.1	1,516.0	1,260.3	116,830	33,223	106,326	53,275					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 36 - 38 9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.64 for week ended August 29, $3.61 for previous week, and $3.33 for August 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of September 9, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11.125-11.625	13-13.8	11.25-11.75
Premium gasoline	12.25-12.875	14.5-14.8	12.5-12.75
42-44 w.w. kerosine	8.875-9.25	10.15-10.4	9-9.5
No. 2 straw fuel oil	7.875-8.25	9.15-9.4	8-8.5
No. 6 residual	$1.10-1.25	$2.15-2.40	$1.80-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6.375	5.875	6.125
Grade 18-55	7.65	7.15	7.40

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13.75
750 vis., No. 3-4 neutral	16.75
2,000 No. 5-6 neutral	18-18.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	20.5-21.5
200 vis, No. 3 neutral, 0-10 pp.	14.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	25.5
180 vis., 10 p.t. neutral	27.5

WAX

Mid-Continent

132-134 A.M.P.	6.0

SOME gasoline moving out of the Mid-Continent area by pipe line is being sold at 11.125 cents a gallon plus pipe-line transportation charges. This price is 0.25 cent under what suppliers quote as the Group 3 low.

Reports of sales indicate that at least part of the movement at the lower price is tied in with exchange arrangements between suppliers on the pipe line and others who market chiefly on the river. As long as the gasoline supply along the pipe line tended to be tight, any river marketer who had gasoline on the pipe line because of an exchange for gasoline delivered at river terminals had no trouble moving the material at the Group 3 low plus 0.5 cent plus pipe-line transportation. With the trend this summer toward a surplus on the line, the river marketers have had some trouble finding customers for exchange gasoline to be delivered at pipe-line terminals. Since these river marketers as a rule do not have regular customers along the pipe line, the movement of any exchange gasoline is on the spot market. The slightly soft Group 3 market is getting pressure from these semidistress sales.

The current trend in refinery quotations for Group 3 shipments point to a possibility that these prices in the future may be based more on pipe-line prices than on tank-car sales. In the past the Group 3 low for gasoline was based on tank-car shipments in competition with sales to certain areas out of pipe-line terminals. In most cases, the advantage of pipe-line transportation made it possible for suppliers to get the Group 3 low plus 0.5 cent plus pipe-line charges for gasoline delivered out of pipe-line terminals.

The strength of the early-season distillate market on the East Coast still depends on the volume of material that moves to secondary and consumer storage over the next few weeks. A dull trading period is expected following the expiration of the discount period at the end of September.

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Prices East of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective August 1, 1953.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.55
Southwest Pennsylvania	4.11
West Virginia	4.05
Ohio	4.04
Illinois Basin	3.02

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SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE

Blaw-Knox Glycol Dehydration Plant complete with necessary fixtures to handle 60 million cubic feet of natural gas per day at 200 lb. working pressure. Plant is in operation but can be dismantled for shipment in a month's notice. Located at Pavonia, Richland County, Ohio.

THE OHIO FUEL GAS COMPANY
R. F. Asel, Manager Purchases & Stores
99 N. Front Street, Columbus, Ohio

Large Diameter NEW STEEL PIPE

8⅝"	O.D.	.250 wall	1250 feet
8⅝"	O.D.	.352 wall	1080 feet
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14"	O.D.	.250 wall	400 feet
16"	O.D.	.250 wall	1600 feet
24"	O.D.	.281 wall	4500 feet
24"	O.D.	.406 wall	1500 feet
26"	O.D.	.281 wall	2400 feet
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30"	O.D.	.500 wall	3000 feet

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BETHLEHEM TWISTER

Both Rigs Have
131′ & 126′ Lee C. Moore Masts with substructures, Diesel Twin 6 GMC's compounded, 214-P Oilwell mud pumps, 4½" drill pipe, shale shakers and mud pits. Operating currently West Texas. Complete inventory furnished upon request. Box 176 Salem, Illinois.

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FOR SALE: 1—M318-32—Cooper Double Drum Winch w/Cross Arm Spudder, including electric starting, air front controls, combination carburetor for gas, gasoline, & butane, and one 62 ft., 3 sheave heavy duty mast. Equipment mounted on 3 Ton International tandem truck. Williamson Well Service, Okmulgee, Okla. Phone 249.

SULLIVAN 200, trailer mounted, complete with all tools, contact for inventory and price. Mesker Drilling Company, Box 6157, Tulsa, Phone 5-9357.

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1800 ft.—7" O.D., 24# Seamless
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2400 ft.—7" O.D., 24# Lapweld
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Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

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For gathering service—Water tanks or conversion to fire fighting equipment

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REASONABLY PRICED

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G-36 Emsco Drawworks with two JL-1335 Buda Engines.
FXZ Gardner-Denver 7¼" x 12" Pump.
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10¾" Shaffer Blowout Preventer.
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OIL WELL SUPPLIES
TULSA, OKLAHOMA

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12,700 ft—30" O.D. x .375 Wall, A. O. Smith Sub-standard 100# W.P. Electric Weld Steel Pipe, 40' DRL, beveled ends. Located Houston, Texas. Priced at less than mill.

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10	2" 11½ thd	2000# Orbit CS
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20	3"	2000#
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2	3" 8V thd	1000# Kerotest—J
2	3"	4000#
4	3" 8V thd	1600# Nordstrom—Plug
4	4"	4000# Kerotest—J

18,000 ft. ¾" Sucker Rods Gr. N 26-28' Like New

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2" tubing—50,600 ft. No. 1; 12,000 ft. No. 1B; 43,600 ft. No. 2; 1,600 ft. No. 2, extra heavy galvanized.

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4¼" line pipe—3,000 ft. No. 1 & 2

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Tanks—10,000 to 50,000 bbls

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OUTSTANDING FEATURES

★ 2500 BBL. Crude Unit
★ 1770 BBL. Thermal Cracking Unit
★ 750 BBL. Reforming Unit
★ **100 BBL. POLYMERIZATION UNIT**

(Installed new 1951, skid-mounted)

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TOTAL CAPACITY—50 MILLION CUBIC FEET PER DAY

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7—8000 GAL. R.R. TANK CAR tanks with heating coils in New Jersey $685 each. Lestan Corp., Rosemont, Pa.

2—4" x 14" Type VSF Clark Cylinders for Angle Type Compressors. Serial Nos. 17707 & 17708—New. 1—4¼" x 14" Ditto, Ser. 17709—Used but Factory overhauled since last used. 2—4¾" x 14" Type VTH Ditto, Ser. Nos. 8678 & 8679. Used but factory overhauled since last used. The compressors cylinders may be inspected in our place of business at 1523 S. E. 29th at Oklahoma City. Berg-Dorf Pipe & Supply Co., P. O. Box 4185, Oklahoma City 9, Okla. Melrose 8-3369.

VACUUM PUMP: Unused 1946 Model—Ingersoll-Rand Model V-67 Single Stage—Size 6 X 6 X 5 with 2" Suction and Discharge, equipped with 5 HP General Electric 440 Volt Motor 3 phase 60 cycle, 1750 R.P.M. F.O.B. Price, St. Elmo, $500.00. SCHROEDER & HERMANN, 898 Haller Ave., Wood River, Illinois.

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A SURE SOURCE OF SUPPLY AT ALL MARKET LEVELS FOR CASING, TUBING AND LINE PIPE. INQUIRIES SOLICITED.

FOR SALE at Roundup, Montana, a quantity of 7⅝" 26.4#, new; 8⅝" 32# new and used, and 36# new casing. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: 7500' 4½" 16.60# Sonoscoped Drill Pipe 4500' 3½" 13.30# Reg. Drill Pipe. 1—6" x 41' Square Kelly, Rotary, Cable Tool and production equipment. Giffin & Thompson Supply, Hoisington, Kansas. Phone 477.

1—NEW & UNUSED WOOLEY (Houston Armature Works) 25 K. W., 31.30 K.V.A. 4-Wire, 3-60-220, or 1-60-110, 1200 RPM, AC Generator, General Electric Type B Exciter 115 Volt, Direct Connected to New Model K428, 6 Cylinder Buda Gas Engine, Complete With All Accessories, Mounted on Steel Skid, F.O.B. Tulsa, Okla.—$2250.00. 1—Practically New (Excellent Condition) Model S. Century Electric Co., 30 K.W. 37.05 KVA, 3-60-127-220, 1800 RPM, AC Generator With Exciter General Electric Panel Board, Direct Connected to Model DTD 317 Buda Diesel Engine, Complete with All Accessories, Mounted on Steel Skid, F.O.B. Tulsa, Okla.—$2250.00. 1—Practically New (70 Hrs. Service) Lombard (Comparable to Model 3490 Gould) Model WH, 1000 GPM, 281 Foot Head, 120# Pressure, 1800 RPM, Split Case, Single Stage, Centrifugal Pump, 6" Suction, 4" Discharge, Direct Connected to Model 33R, 6 Cylinder Continental Engine 100 H.P. at 1800 RPM, Complete With All Accessories, Mounted on Steel Skid, F.O.B. Tulsa, Okla.—$1500.00. H. A. McCarthy, 310 Thompson Bldg., Tulsa, Okla.

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MID-STATES PIPE & SUPPLY CO.
Ph. 2-9128 Tulsa, Okla.

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WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

NOTICE: We buy. We sell equipment everywhere. If you want to sell or buy, contact Pressey & Son, Pueblo, Colorado.

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MAJOR DRILLING COMPANY has position in the U. S. for combination electrician-mechanic capable of working on electrical drilling rigs. Write Box G-673, The Oil and Gas Journal, Tulsa, Oklahoma, giving full particulars if interested.

PETROLEUM ENGINEERS — Expanding chemical and fracturing service firm requires petroleum engineers under 30 for development and sales work. Limited experience acceptable. Firm is one of oldest in the business operating in Texas, Oklahoma, Louisiana, New Mexico and Kansas. Box G-652, The Oil and Gas Journal, Tulsa, Oklahoma.

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Young engineers capable of mechanical estimating for construction of refineries, steam power and similar industrial projects. Must have some field experience. Considerable weight given to ambition, intelligence and interest in estimating and cost analysis.

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Preferably with an advanced degree and a minimum of 5 years' commercial or academic experience. To work in the New York research laboratory of a major oil company. This position demands broad interests in Stratigraphy and Biofacies and the capacity to do independent work on projects assigned. Salary dependent on experience and qualifications.

Write giving personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
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HELP WANTED

VACANCIES for experienced Geologists in Indonesia and India Pakistan. Write Oil Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974.

OIL Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

PETROLEUM ENGINEERS

FOREIGN SERVICE

Graduate engineers with good background in general physics, mathematics, mechanics and with some laboratory experience in equipment and techniques. For laboratory position responsible for theoretical experimental studies on reservoir fluid and rocks. Duties will consist of designing equipment, performing or supervising, testing and analyzing and reporting results. Studies pertinent to evaluation of primary depletion practices and applicability of secondary recovery for pressure maintenance operation will be required.

Please write giving full particulars regarding personal history and work experience. Please include telephone number.

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BOX OG-5

Arabian - American
Oil Company

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HELP WANTED

MANUFACTURERS AGENT, Commission Sales Representative, or Sales & Service Firm to handle outstanding lines of oilfield specialty products for Manufacturer-Distributor. Must have close personal contacts with steam and power drilling rigs and operating personnel in area. Several territories available: portions of Louisiana and Texas Gulf Coast, Rio Grande Valley, East Texas, possibly others. Box 6352, Houston 6, Texas.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

INDEPENDENT COMPANY DESIRES Geologists—Geophysicists—Computers to be based in Oklahoma City. Qualified men who wish to advance themselves. Telephone Victor 3-1362 or write K. L. Spire, 7624 N. May Avenue, Oklahoma City, Oklahoma.

PETROLEUM GEOLOGIST with about 10 years' experience in oil field mapping wanted for work on Staff of large producer. Duties include surface mapping within the Rocky Mountain Area.

Give references, details of education and experience, and salary expected in letter, and include photograph.

Box G-641, The Oil and Gas Journal, Tulsa, Oklahoma

Geophysical Personnel

Newly organized subsidiary of Standard Oil Company of California needs Party Chiefs, Computers, and trainees with educational background in geological and geophysical sciences.

Please write giving full particulars regarding personal, educational and experience qualifications or call for appointment interview.

CHEVRON OIL COMPANY

3800 West Alabama

Houston 6, Texas

Rig manufacturer wishes to employ graduate engineer with 5 to 10 years oil field experience for sales promotion, advertising and production planning. Permanent and lucrative position to man who can produce. Reference and experience with first letter requested. Box G664, Oil and Gas Journal, Tulsa, Oklahoma.

PROJECT ENGINEER

National Engineering and Construction Company seeks an experienced Project Engineer with several years of refinery plant engineering background for work in the Midwest.

This man must be capable of taking complete charge of a job, supervise layouts and design, select plant equipment, and maintain amiable customer relations.

In applying furnish a detailed resume of your education, experience, references and a recent snapshot. Salary open.

Box G-691, The Oil and Gas Journal

P. O. Box 1260 **Tulsa, Oklahoma**

HELP WANTED

CHEMIST to take charge of large independent oil company laboratory located in Great Lakes area. All applications strictly confidential. Experience required in laboratory administration. Give full details of education and experience. Reply to Box G-687, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, not over 30, with some natural gas distribution system operating experience. Position is with a large natural gas company and requires substantial amount of travel by auto and ability to meet and associate with many people. In reply give complete data, including present salary, which will be held in confidence. Box G-661, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEERS, age 25 to 40, to sell oil well producing equipment and prefabricated steel buildings in Eastern states. Applicants should have previous selling experience and either mechanical or petroleum engineering degree. Starting salary depends upon previous experience and record. Automobile and expense account furnished. Address Box G-688, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST

With degree in Geology and a minimum of 3 years' subsurface experience on deep wells. To work in Saudi Arabia on deep wells making lithologic and faunal logs from cores and cuttings, interpreting electrical logs and working on field and regional stratigraphic studies. Salary commensurate with experience and qualifications.

Write giving personal history and work experience. Please include telephone number.

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Arabian - American Oil Company

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SITUATIONS WANTED

GRADUATE ENGINEER: Age 43, 20 years' experience in Texas, Oklahoma, and New Mexico. Have held responsible positions in drilling, engineering and production management. Box G-690, The Oil and Gas Journal, Tulsa, Oklahoma.

INSTALLATION maintenance of microwave, other communications systems with pipe-line company. 20 years' radiotelephone, 3 years' laboratory work radar. 2 years' college engineering. Wilbur Whitnum, 264 B. Papworth Ave., New Orleans 20, La.

HAVE five years management experience in fair size oil operation, including exploration, development, production, sale of oil, leases, contracts, etc. Have master's degree petroleum engineering and substantial geological experience. Desire position with small group or independent interested in oil exploration and production. Presently located Rocky Mountain area. Box G-683, The Oil and Gas Journal, P.O. Box 1260, Tulsa, Oklahoma.

SITUATIONS WANTED

EXECUTIVE Accountant—Office Management, taxes, insurance. Thoroughly experienced, under 40. Salary requirements $8,000.00. Confidential. Box G-674, The Oil and Gas Journal, Tulsa, Oklahoma.

CONTROLLER, Office Manager, General Manager desires responsible supervisory or administrative position with oil or gas company. Nineteen years' diversified experience with independent producing and drilling companies. Accounting and tax background. References. Mid forties, married, will relocate. Box G-678, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL ACCOUNTANT—Office Manager. College training, five years experience. Capable administrator, financial statements, taxes, all phases of accounting. Box G-668, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: B.S. Degree. 10 years' experience in production, drilling, and reservoir engineering. 8 years with major oil company, 2 years with small independent. Age 33. Desires position with either major or independent oil company anywhere in U.S.A. or Canada. Above average academic and professional background. Complete resume upon request. Box G-680, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

LANDMAN—Legal training and 7 years experience major company office and field. Desires change to expanding independent. Can relocate and travel. Box G-675, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION EXECUTIVE Geologist and Engineer, experienced direction exploration programs (geology, leasing, drilling, testing). Past experience Latin America and Mid-Continent last four years Kansas, age fifty, broad managerial experience. Box G-665, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED GEOLOGIST

Desires connection with strong independent oil company or financially able group who are interested in obtaining oil production. Sixteen years' experience in Rocky Mts., Mid-Continent, Texas, New Mexico, Canada. Major company experience. Executive and supervisory experience all phases. Willing to travel and supervise operations. Fully qualified to organize exploration department.

Box G-693
The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

REFINERY ENGINEER — Maintenance, construction and design of fluid and thermofor crackers. Desires contact with progressive refiner. Age 29. Box G-606, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL AND GAS ENGINEER: 33 years old, single, M.S. in chemical and gas technology. (Institute of Gas Technology). Five years experience in chemical, four in natural gas industry. Chemical research. Supervisory experience. All phases of natural gas design, FPC reports and testimony. Economic studies. Know accounting. Technical articles published. Box G-684, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, University of Wisconsin 1950, married, age 31. Desires position with future. Box G-692, The Oil and Gas Journal, Tulsa, Oklahoma.

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CALIFORNIA OIL PROPERTIES

Containing 27 producing and two idle wells, two of which are in Huntington Beach, one in Rosecrans-Athens, and remainder in Long Beach-Signal Hill field. Gross daily production about 360 bbl., net owned about 280 bbl. daily. Oil not under contract. Recent engineering report and other data available for inspection at address given below.

Properties will be sold only as a unit. Sale will include all fixed lease equipment used in operation of wells. All oil produced and on hand at close of escrow will be excluded. Terms of sale cash upon confirmation; 10 per cent of amount offered to be deposited with bid. Bids to be in writing and will be received on or before Oct. 30, 1953, by

MILTON H. PHILLEO, Executor,
Estate of Louise E. Dabney,
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WE WILL buy producing or non-producing oil royalties. Standard Security Company, 111 Broadway, New York 6, N. Y.

PRODUCING ROYALTY and overrides for sale. Wire-write-call for particulars. JACK EAGLE, 700 City Natl. Bldg., Okla City, Okla. REgent 6-7027.

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SHALLOW DRILLING BLOCK: Interest checkerboarded on 9,300 acres in McCulloch County, Tex., to test the Cambrian Series through the Wilberns & Hickory. No Bonus, Override or Oil Payments. Quick action. J. E. Alexander, 1922-7st. Lubbock, Tex. pho. 34317; if no ans. call Brady, Tex. Brady Hotel pho. 2470; Lohn, Texas phone 19.

FOR SALE—MONTANA MINERAL RIGHTS—Cheap price range. Good return from lease rentals. Also CHEAP LEASES. All in active areas. N. R. Brasted, 816 Sinclair Bldg., FOrtune 3313, Fort Worth, Tex.

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FOR SALE: 160 acres, 12-year-old lease. Settled production 200 bbl., approximately $250,000.00 physical inventory. A dozen different pays—great possibilities. Must be a bonafide company. Major company preferred. Box G-681, The Oil and Gas Journal, Tulsa, Oklahoma.

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SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

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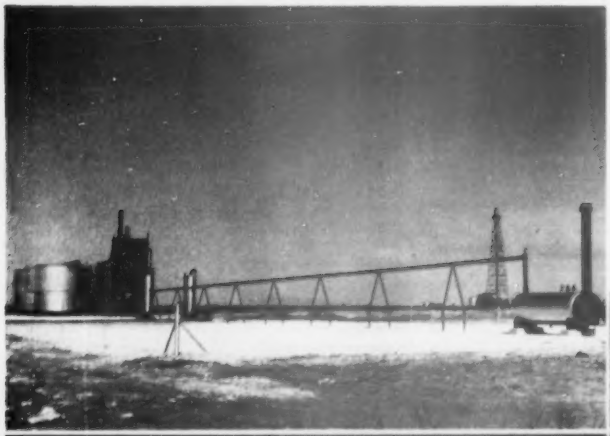
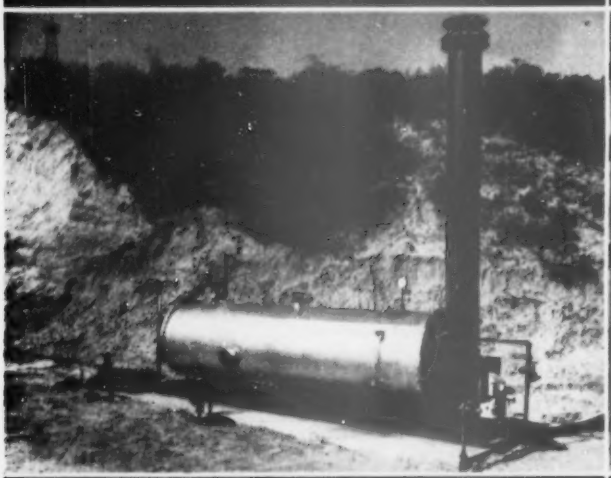


National Steam Generator in West Texas making steam for "U" Type Condenser located in wood treater.

National Steam Generator in Western Nebraska furnishing heat to tank coils to treat oil and keep storage at pipeline temperature.



National Steam Generator in California handling 460 bbls. of 12° API Gravity crude per day at 170° outlet temperature.

National Steam Generator in Utah keeping production in stock tanks at 110°. Crude is 37° gravity with pour point of 90°.

NATIONAL HORIZONTAL STEAM GENERATORS

(14½ PSI)

GENERAL SPECIFICATIONS

Size	Heat Cap. Rating Btu/Hr.	Model	Approx. Shipping Weight
2 x 6	250,000	B26	1150#
3 x 7½	500,000	B37	3200#
3 x 10	750,000	B310	3400#
3 x 12½	1,000,000	B312	3600#
4 x 10	1,300,000	B410	4600#
4 x 15	2,000,000	B415	6180#

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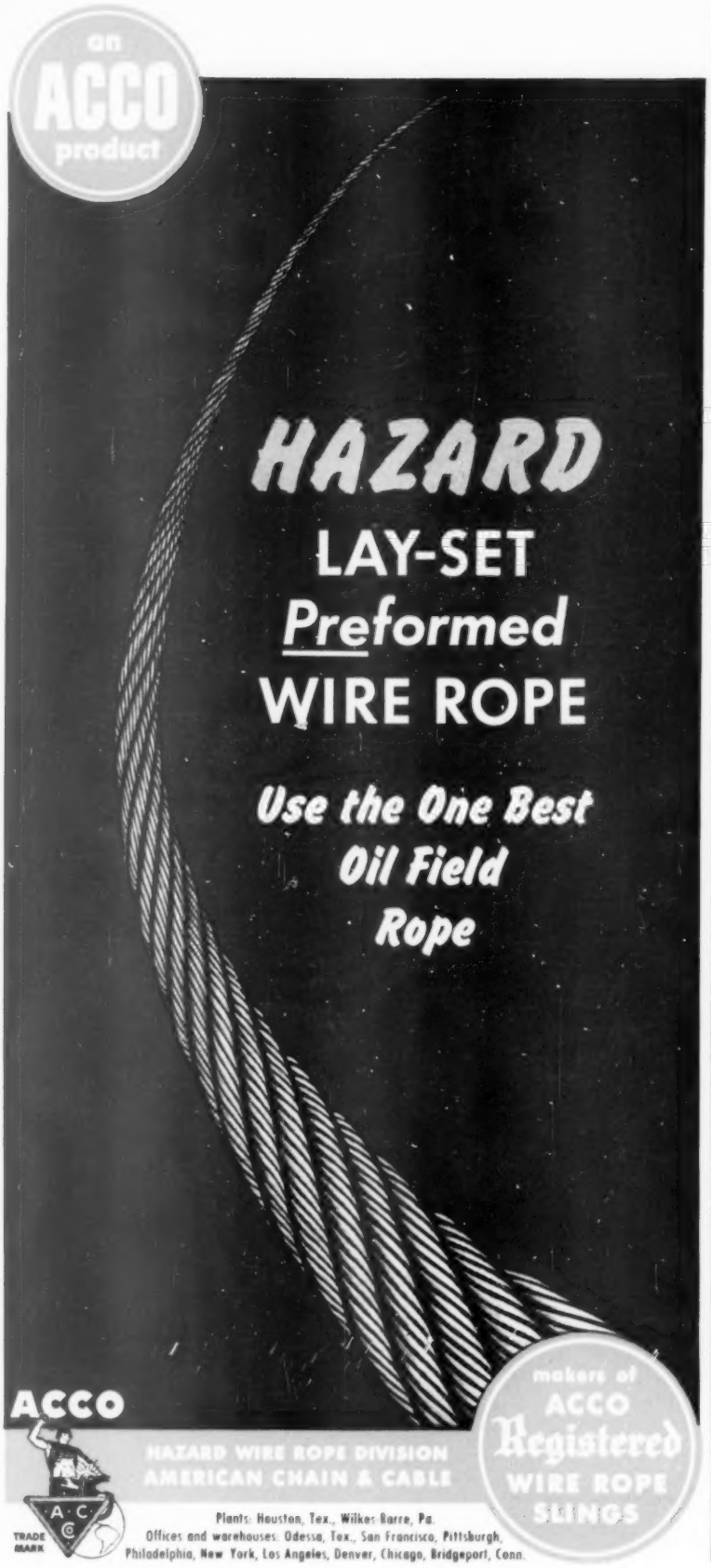
NATIONAL TANK COMPANY

TULSA, OKLAHOMA

5-6-52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DRILLING

Seven Practical Rules Increase Service from Rotary Drilling Lines

The drilling line is one of the most costly expendable items in rotary drilling, so if by following certain recommended practices the driller can increase the life of his line, the cost will be reduced. Here in concise, boiled-down form are seven practical rules for buying and using rotary drilling lines:

1. **Buy only the best** type and grade wire rope. It is false economy to buy any but the best line to meet the severe service requirements of rotary drilling. The best line is 6x19 Seale, improved plow steel with wire core, and of course, preformed.

2. **Buy lines long enough** to allow for sufficient cuts at the drum end. Lengths should be based on practices in your local field. The longer the line, the more ton-miles per foot you'll get.

3. **Set up a uniform number of ton-miles** between cuts so you'll have a basis for evaluating the actual work done since last moving the line to change wear points. This will avoid the need for long cuts to remove worn line sections.

4. **Inspect your line at regular intervals**. Avoid unnecessary abuse and excessive wear. Inspect at least once each day, preferably once each tour.

5. **Use drum-type tie-down** so as not to distort or damage a part of the line which will later have to pass through the blocks. The drum-type reduces the time required for cutting the line.

6. **Keep daily ton-mile service records** at the rig. One of the simplest and easiest to use records which we have seen is available without charge through Hazard wire rope distributors. It is a three-cover book with replaceable record pad and provides a permanent record for home office analysis.

7. **Get the advice** of your local Hazard wire rope distributor or Hazard representative. He has had broad experience in selling and servicing rotary drilling lines and can give you information which will save you money. What he has learned in talking with drillers on the wide variety of rigs being used in old and new fields can be worth a great deal. He carries a stock of the popular sizes of drilling ropes and is ready to serve you at any time.

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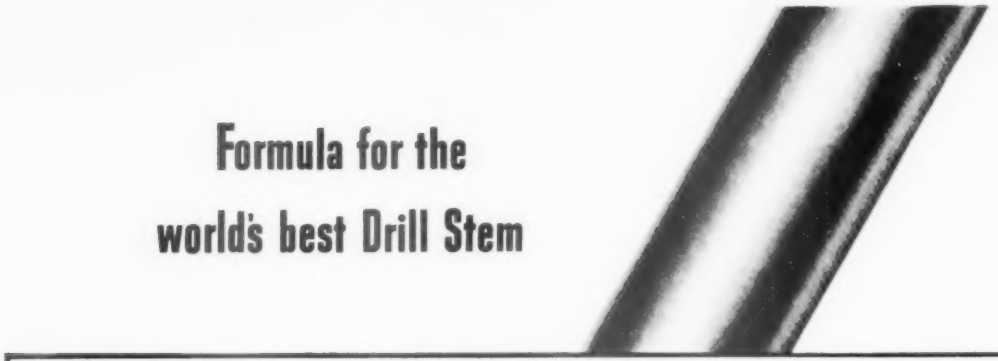

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